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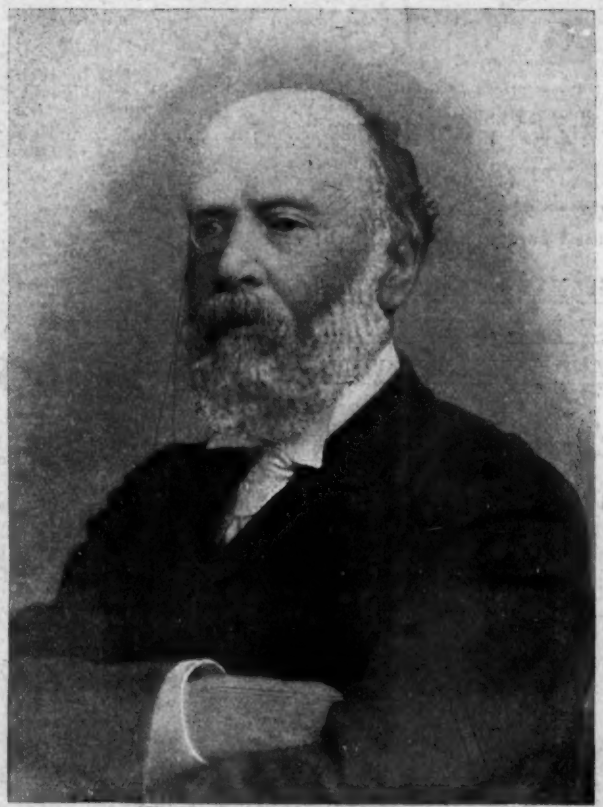
THE PRACTICAL TEACHER



"EDUCATION IN PARLIAMENT."
THE RIGHT HON. SIR JOHN ELDON GORST, K.C., M.P.

CONTENTS
OF THE
JUNE NUMBER.

EDUCATION IN PARLIAMENT—MAY .. 605
SIR JOHN GORST'S EDUCATION BILL .. 607
EDUCATIONAL HOLIDAY COURSES WITH OUR CONTINENTAL NEIGHBOURS, 1901 .. 608
PROGRAMMES AND HANDBOOKS .. 610
THE CHILDREN TO THE MOTHER. Mr. Sadler on Colonial School Systems .. 612
BY MANY HANDS .. 614
N.U.T. NOTES .. 617
NOTES FROM THE NORTH .. 618
WITH OUR CHILDREN. By John Gunn, M.A., D.Sc. .. 619
THE LATE REIGN .. 621
WIRELESS TELEGRAPHY. By C. A. West, B.Sc., A.R.C.S. .. 623
A COURSE OF OBJECT LESSONS FOR GIRLS' SCHOOLS. By W. Done, B.A. .. 625
STUDIES IN GEOGRAPHY. By F. H. Shoosmith, Ph.D., B.Sc. .. 626
PRACTICAL ELEMENTARY SCIENCE .. 628
OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK .. 630
HISTORY UNDER THE PRESENT CODE .. 631
BROWN PAPER ILLUSTRATIONS FOR LESSONS. By Edith E. Bamford, Art Teacher, Edge Hill Training College .. 632
THE INSPECTOR'S NOTEBOOK .. 633
OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE. By A. T. Flux .. 635
OUR CERTIFICATE COURSE FOR 1901. By G. Collar, B.Sc. 639
LONDON MATRICULATION. By R. C. B. Kerin, B.A. .. 643
OUR QUERY COLUMN .. 646
PRINCIPAL ALTERATIONS IN THE DIRECTORY FOR 1901 648
PHYSIOGRAPHY .. 649
CHEMISTRY NOTES .. 649
ELECTRICITY AND MAGNETISM .. 650
THEORETICAL MECHANICS .. 651
OUR FRENCH PRIZE COMPETITION .. 652
"AT THE SIGN OF THE PAPER-KNIFE" .. 653
SCIENCE NOTES .. 654
THE EDITOR'S TABLE .. 655

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THE PRACTICAL TEACHER

A MONTHLY MAGAZINE AND REVIEW

FOR THE SCHOOL-ROOM AND THE STUDY

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EDUCATION IN PARLIAMENT—MAY.

"EDUCATION in Parliament" I have written at the fair head of this page, but perhaps "The Practical Teacher in Parliament" might be an apter title. If for the last five years education has ceased to occupy a back seat on the green benches, the change is mainly due to the presence of practical teachers in the Witenagemote. That, at least, is one theory of causation; the other is, that events have forced education and the shrinking, blushful Three to the fore.

Sir John Gorst would accept neither theory. Sir John would say, no doubt, that it is a Vice-President absolutely eruptive with burning zeal who has worked the change. The Three indeed! Sir John is not particularly fond of them. But, then, he is not particularly fond of anybody; the most friendless man in the House of Commons is the Right Honourable Sir John. The House would get on very well without the Three, is probably his private opinion; and then the legend of Gorst, the Earnest Educationist, might keep its bloom a little longer.

A strange man Sir John! one of the cleverest, and, at the end of six-and-twenty years of membership, one of the least successful men in Parliament, he. Relatively, that is, of course; for his career is not to be sneezed at. It is believed that he was once a practical teacher himself—of the endowed school type; it is known that he was Third Wrangler and Fellow of St. John's before the Three were born; he is a wrangler to this day, say his colleagues at St. Stephen's. Sir John is P.C., K.C., M.P., LL.D., F.R.S.; he has been a decent Solicitor-General, an indifferent Under-Secretary for India, an average Secretary to the Treasury, and a disastrous Vice-President of the Committee of Council.

> Sad was the hour, and luckless was the day,
> When he to Whitehall's walls first found his way.

A man who was Solicitor-General in 1885 ought to be Lord Chancellor, or Master of the Rolls at least, by now. He ought by now to be wearing a wig instead of a beard, and to be sitting as a Lord of Appeal in the House of Lords. Yet it is safe to say that, when the present Ministry comes to its end, *hic jacet* may be sorrowfully written over the career of the Right Honourable Sir John Eldon Gorst, K.C., M.P., and all the other letters of the alphabet—the unknown *x* in particular.

The man who was the yeasty brain of the "Fourth Party" from 1880 to 1885, might well have expected a better *finis* than to go down to memory as the most injurious or impotent Vice-President of the Committee of Council since Robert Lowe. The truth is that he is his own enemy; that he is an "impossible" colleague, who has always stood in his own light. But his path to the political Avernus has always been paved with good intentions.

A strange man Sir John! rightly considered, the most pathetical figure in the Commons, now that Leonard Courtney has left these shades. A man who imagines ideals, and smiles while his colleagues baffle, slight, or even outrage them. "He is of a resigned but not a resigning nature," a man in the Press Gallery said to me one night, as we looked down and saw Sir John deftly swallow a pet project and remain in his post. A man long-suffering, sorely tried, wronged, flouted, and martyrised, is Sir John; but even his most lenient critic will allow him to be a man with a limpet-like adhesion to office—any office—at any cost.

Now it is upon the track of this good man struggling with adversity that the dauntless Three have come crowding. They question him, bother him, poke him up: no vice-president ever had to suffer a plague of practical teachers before. They trip him up on technical points of fact; they lard him with compliments so long as he goes right, they attack him with oratorical arrows and assegais directly he goes wrong. He has

End of the Half Price Offer of the "Encyclopædia Britannica," see page cvi.

little peace of his life for them; and he is one whose head many winters have snowed upon, poor man. No other minister in the House has such a persistent, wakeful band of critics as the dauntless blushful Three.

Sir John conceals his sentiments about his three honourable friends behind a particularly convex pair of glasses; but as he listens to them, his lip curls within his immaculate Pantaleonic beard. Up in the Press Gallery we take much interest in the relations between these four members; we rather like Sir John, he plays to the gallery—the Press Gallery—so well. So we turn our pens upon his three critics now and then with gusto.

If Mr. Gray gets up behind Sir John, and rates him, and expresses astonishment at him, and generally tries to goad him back into the true path, the Press Gallery nibs its pen, and writes of Mr. Gray's "dandy cocksureness" and his "studied reluctance to keep silence." If Mr. Yoxall goes for Sir John across the floor, as beseems a member of the Opposition to do, the Press Gallery compares him to "an æsthetic R.A.," and his speech to the giving of a dictation lesson. When Dr. Macnamara appeared on the Parliamentary stage, it was almost too much for the Press Gallery. "What! will the line stretch out unto the crack of doom?" we gasped, and straightway described the new practical teacher's voice as "ringing out like a pistol with an American accent."

An infinitude of pressure, public and private, has brought about at last the *début* of an Education Bill. It came like the traditional bolt from the blue upon most of us. May the seventh, and Sir John Gorst rose to move the Bill that everybody but the Three, perhaps, believed would never see the light this session. Probably nobody was more surprised at it than Sir John, and, it is fair to say, nobody more pleased. Probably his hopes were great: great, certainly, were the expectations of his audience, and hopes and expectations expanded during the first twenty minutes of the speech. Did Sir John not argue in favour of one local authority for all forms and grades of education in the locality? A premiss absolutely sound, to which all parts of the House are ready to give assent. Did he not go on to argue that one existing authority *must* give way to the other, so that unification might take place? Did he not show that the one to give way must be the School Board? Did he not speak of the impracticability of taking power from an existing authority except by causing it to cease to exist? All this pointed to a Bill for unification, and hopes ballooned higher than ever.

And then—"most lame and impotent conclusion!"—the rest of the speech showed that there were *still* to be two local authorities, without method of unification; that the "one and the same" principle was *not* to be put in force; and that the School Board *was* to be robbed of some of its powers while still continuing to exist. "The clauses of this Bill are not in accord with the preamble." Mr. Yoxall stormed, and Dr. Macnamara skilfully damned the Bill with faint praise. It began to dawn upon the House that the Bill, so miraculously appearing, was in reality *ridiculus mus*. And Sir John Gorst sat calm upon the green morocco like—to use his own phrase—"a Buddhist received into the eternal Nirvana."

Perusal of the plan in print has rather strengthened the unfavourable impression among members to which two of Sir John's friends the practical teachers were the first to give voice. But the Press Gallery hears from the lobby that the Government mean the Bill to proceed. The Duke of Devonshire, that strange, sleepy man, so uncouthly in earnest, is said to make the pushing forward of the Bill the condition of his remaining in the Cabinet. The Liberal leaders are rather divided in opinion on the main feature of the Bill so far. Mr. Bryce approves the County Council as an authority for education. Sir William Harcourt, measuring the County Councils by that for Hants, is said to consider them inferior for the purpose to School Boards. The Bill was drafted six times, I am told, before it took its printed shape; it will have to run the gauntlet of a good many other alterations before it passes into law.

That other scholastic Bill, the Bill for protecting the tenure of office of teachers, is hanging fire a little. Hopes were entertained that the Education Bill might, directly or indirectly, deal with the point. Had the new local authority in the Bill possessed powers for the administration of elementary education, it would have been easy to enact that teachers should not be dismissed except with the assent of the county authority, to whom the appeal would lie. It would not be wise to be sanguine about an Appeal Bill. Two sets of persons will scrutinise such a Bill very keenly. The School Boards will not be ready to relinquish their powers of dismissal absolute; the clergy will be slow to agree to the loss of their authority over the parish teachers. The Tenure Bill has a long row to hoe, and the Three will find plenty of work to do in connection with it before it receives King Edward's assent. The Education Bill rather stands in its light.

Meantime, Mr. Cockerton, promoted from scanning the School Board accounts in North London, is turning his eagle eye on the books of the London Technical Education Board. Every morning he opens his newspaper—*any* newspaper—and finds his name writ large in many columns; Lord Roberts himself is hardly now such a cynosure of the public press as he. The London Technical Education Board may well tremble; it is by no means sure that Parliament next session may not have to pass a Bill in a hurry to prevent the surcharge of Mr. Organ for signing London Technical Education cheques. Mr. Organ's proposal that the Board should go in more for evening continuation school work is receiving attention in Parliament, but the Cockerton Appeal Committee will be just as ready to avert the evils of cheap Technical Education Board instruction as they were to save the nation from the maw of the School Boards.

All things considered, there seems little prospect of educational subjects going to sleep this Parliament, and there will continue to be lively occupation for Sir John Gorst and his friends, the dauntless Three. One hears no rumours of any intention on the part of Sir John to resign his post if the Education Bill is not pressed on victorious; and for some years to come, at least, the schools are like to remain under his paternal care. The committee of educationists in the House of Commons which one hears of is said to have drafted a scheme for the better financing and managing of Voluntary schools—a consummation devoutly to be wished. But it will cast the "intolerable burden" of these schools upon the shoulders of Sir John and the Three during legislation, and the bishops will have much to say to that, and Cardinal

BRITISH MUSEUM

Vaughan, and Mr. Perks, M.P., and the Free Church councils. Looking down from the Press Gallery upon the seething ferment of the House of Commons, and knowing how delicate, perilous, confused, personal, and endless are the politics of education, I cannot but feel that if one *must* labour in Parliament, it is less pleasant to labour there with speech, and scheme, and vote, than calmly to describe with the pen.

SIR JOHN GORST'S EDUCATION BILL.

(To make provision for and confer certain powers on local Education Authorities in England and Wales.)

BE it enacted by the King's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows :—

1.—(1.) The council of every county and county borough, acting through an education committee constituted in accordance with a scheme made by the council and approved by the Board of Education, shall be the education authority for the county or county borough.

(2.) Every such scheme shall provide that a majority of the members of the committee shall be members of the council, and that there shall be other members, male or female, not members of the council.

(3.) Any such scheme may, for all or any purposes of this Act, provide for a joint education committee of two or more councils, or for a separate education committee for any part of a county, and may make such provisions as appear expedient for carrying this Act into effect. In the case of a separate committee, it shall suffice that a majority of the members are members of either the County Council or the council of an urban district.

(4.) A scheme, when approved, shall have effect as if enacted by this Act, but may be revoked or altered, by a scheme made in like manner.

(5.) If a scheme has not been made for a county or county borough and approved by the Board of Education within *twelve months* after the passing of this Act, that Board may make a scheme. A scheme so made shall be laid before each House of Parliament for a period of not less than *thirty days*, and if either House before the expiration of that period presents an address to His Majesty against the scheme, or any part thereof, no further proceedings shall be taken thereon, but otherwise the scheme shall have effect as if made by a council and approved by the Board of Education.

(6.) Before approving or making a scheme for the constitution of an education authority, the Board of Education shall take such measures as may appear expedient for the purpose of giving publicity to the provisions of the proposed scheme, and may, if requisite, hold a local inquiry.

(7.) An education committee shall not have power to raise a rate or to borrow money.

(8.) In Wales and Monmouthshire the county governing body under the Welsh Intermediate Education Act, 1889, shall be the education committee under this Act.

2. The residue under section one of the Local Taxation (Customs and Excise) Act, 1890, including any balance thereof which may remain unexpended at the end of a financial year, shall be applicable for the purposes of education, and if so applied shall be administered by the education authority.

3.—(1.) The council of any county or county borough may, by means of the county rate or the borough rate, as the case requires, raise sums for the purposes of this Act, and the sums so raised shall be administered by the education authority, but the amount of the rate to be levied in any one year for those purposes shall not exceed *twopence* in the pound.

(2.) Any purposes for which sums raised by means of a county rate may be applied under this Act may be either general county purposes or special county purposes within the meaning of the Local Government Act, 1888, as the County Council direct, and the council may determine what parishes are to be liable to contributions for any special county purposes.

4. An education authority shall apply to purposes of education all money administered by the authority under this Act, but in the application of money so administered—

(1) shall not make a grant to or establish or maintain—

(*a*) a public elementary day school ; or

(*b*) a poor-law school, an industrial school, a day industrial school, or a reformatory school ; or

(*c*) a school or college conducted for private profit : and

(2) shall not make it a condition of a grant that any particular form of religious instruction or worship is or is not taught or practised in a school or college.

5. In a school or college receiving a grant from or established or maintained by an education authority—

(*a*) A day scholar shall not be required, as a condition of being admitted into or remaining in the school or college, to attend or abstain from attending any Sunday school, place of religious worship, religious observance, or instruction in religious subjects in the school or college or elsewhere ; and

(*b*) The times for religious worship or for any lesson on a religious subject shall be conveniently arranged for the purpose of allowing the withdrawal of any scholar therefrom.

6.—(1.) The council of any urban district may raise sums under this Act not exceeding in any one year a rate of *one penny* in the pound, and apply any sums so raised to purposes of education in accordance with the provisions of this Act as to money administered by an education authority, and in such manner as may be agreed on between the council and the education authority for the county in which the district is situate, or, in default of agreement, determined by the Board of Education.

(2.) Where any money is raised under this section in an urban district, the education authority for the county in which the district is situate shall, on the request of the council of the urban district, delegate to that council such powers of the education authority in relation to the control and management of any school or college within the district as may be agreed upon, or, in default of agreement, be determined by the Board of Education.

(3.) Any sums raised for the purposes of this section shall be paid in the case of a borough out of the borough fund or borough rate, and in the case of any other urban district out of the fund or rate applicable for the general purposes of the Public Health Acts.

(4.) The council of an urban district shall, for the purposes of this section, act through an education committee constituted in like manner and having the like powers as the education committee of a County Council, and the provisions of this Act with respect to the constitution and powers of those committees shall apply accordingly.

7.—(1.) For the purposes of this Act the council of a county may borrow in like manner as for the purposes of the Local Government Act, 1888, and the council of a county borough or an urban district may borrow in like manner as for the purposes of the Public Health Acts, and the provisions of those Acts shall apply accordingly, except that the money borrowed by a borough council shall be borrowed on the security of the borough fund or borough rate.

(2.) Money borrowed under this Act shall not be reckoned as part of the total debt of a county for the purposes of section sixty-nine of the Local Government Act, 1888, or as part of the debt of a county borough or urban district for the purpose of the limitation on borrowing under section two hundred and thirty-four of the Public Health Act, 1875.

8.—(1.) Where a School Board is at the passing of this Act maintaining out of the school fund any school to the maintenance of which the school fund is not lawfully applicable, the education authority may empower the School Board to continue to carry on the school on such terms as may be agreed upon, or, in default of agreement, determined by the Board of Education; and in that case the School Board may, notwithstanding anything in the Elementary Education Acts, apply out of the school fund towards the maintenance of the school such sum as may be agreed on between the School Board and the education authority.

(2.) This section shall come into operation on the passing of this Act.

9.—(1.) Until an education authority is constituted for a county or county borough under this Act, the council of the county or county borough may, with the sanction of the Board of Education, perform provisionally any function of an education authority the performance of which cannot, in the opinion of the Board of Education, be postponed until the authority is constituted.

(2.) This section shall come into operation on the passing of this Act.

10. The enactments mentioned in the schedule to this Act shall be repealed to the extent specified in the third column of that schedule.

11.—(1.) This Act shall not extend to Scotland or Ireland.

(2.) This Act shall, except as otherwise provided, come into operation on the *first day of April nineteen hundred and two.*
(3.) This Act may be cited as the Education Act, 1901.

How the Government Education Bill affects Technical and Secondary Education.

"A Bill to make provision for and confer certain powers on local Education Authorities in England and Wales" is the title by which the Government's scheme for secondary education is called. It creates new authorities—statutory committees of the County and County Borough Councils consisting of members of the councils as to the majority and as to the minority of other persons, male or female, not members of the council. To these new authorities are transferred the powers conferred on Technical Committees by the Technical Instruction Acts: the power to build, maintain, or help any kind of school other than primary, poor-law, industrial, reformatory, or private adventure schools; the control of the "whisky money" (if the County Councils think fit); and the power of rating over the whole or a part of their district to the extent of twopence in the pound. The liberty to contract loans is also given, above and beyond that which the councils have conferred by the Local Government Acts. The new authorities may, if they please, give power to the School Boards to carry on any of the "Cockertonised" schools or classes at present in existence.

The new authorities, then, are Technical Instruction Committees *plus* some outsiders. They have slightly more independence, but their power for good is limited by their limited power of spending. Neither technical nor secondary instruction will be benefited by the passing of the Bill. Their restricted finances will prevent the authorities from materially increasing the facilities for secondary education; and unless they delegate the evening instruction and that of higher-grade schools to the School Boards, they will have no money to carry on or increase the number of schools now in existence. The chaos at present existing will become further confounded by the creation of these authorities. The religious difficulty will be introduced into Town and County Councils; the work of the School Boards will be truncated; and nothing equal or better than the higher-grade and evening continuation schools will be substituted, for want of means to carry them on. If the Bill becomes an Act as it stands, the placing of all schools under one authority will be more difficult than ever.

The Association of School Boards met the Duke of Devonshire during the month, with a view to the retention of their higher-grade work. The second reading of the Bill will not be taken till after Whitsuntide, and many amendments are already indicated against the measure.

Who should Manage Evening Continuation Schools?

The organising secretaries and directors of technical instruction to the County Councils, at their last quarterly meeting, passed a resolution urging that the whole of the continuation schools should be taken over by the County Councils. Dual control certainly leads to waste, but it would by no means be done away with if this were the case. The buildings, apparatus, furniture, all belong to School Boards or the managers of Voluntary schools, the former having to maintain them out of the rates. None know so well the capabilities of many of those who attend the evening schools as the teachers of the day schools. For many years to come we shall need elementary evening schools, as well as science, art, and technical classes. The villages cannot well find room for both sorts in separate buildings, and one authority is the only way out of the difficulty.

EDUCATIONAL HOLIDAY COURSES WITH OUR CONTINENTAL NEIGHBOURS, 1901.

AFTER a glance at our long list of Continental Holiday Courses, no one probably will be rash enough to maintain that the scholastic profession is prosaic and commonplace. At any rate, the summer holiday now offers varied possibilities of romantic change, and temporary relief from the rust and dust of routine. The weary teacher can now hasten away to the banks of Lake Leman, to the shores of the Baltic, or to the heart of Spain, and there, stimulated by his new environment, find profit and recreation in the study of life and language and literature. Those who have not yet tried this kind of educational holiday can form but a vague and imperfect idea of the intellectual enjoyment, the keen pleasure, the quaint humours, the exquisite fun of a sojourn in a foreign university town.

This form of holiday has become almost a necessity with us, and we should have an uncomfortable feeling that we were not properly fulfilling our destiny if we fell back upon an ordinary commonplace tour.

If the language student wishes to minimise expense, he will naturally choose a town of Normandy. We have a pleasant recollection of a holiday month spent some years ago in the ancient town of Caen, where the classes are now organised under the patronage of the Alliance Française, like those of Paris and Nancy. Some, who prefer to go farther afield, will make for Touraine, the interesting country of Honoré de Balzac, Loys le unziesme, and Françoys Rabelais. Others, who do not care to brave the sultry heat of Paris in August, will be drawn to the Swiss Universities or to Grenoble, where they can combine study with Alpine excursions. Unfortunately, English teachers are so timid and unenterprising as linguists, that probably few will seek the old Spanish town of Avila, or the various seats of German learning. It is regrettable that German is not more widely studied in England; for, in spite of the cheap sneer at "the

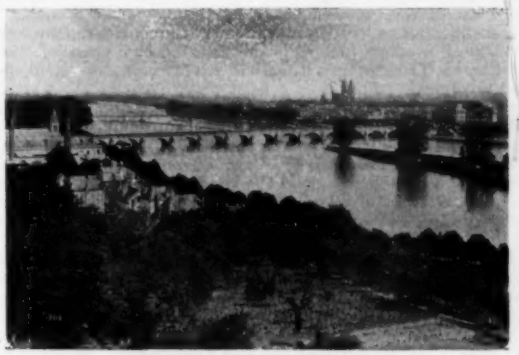
A STREET IN LISIEUX.

inevitable comparison with Germany," this rising nation possesses a robust intellectual vigour with which it is well for the Anglo-Saxon to keep in touch.

Whatever spot the student may ultimately choose as his destination, he need not fear dullness or tedium; for the humours of student life at holiday courses is infinite, and but for the respect we owe to THE PRACTICAL TEACHER as a serious educational journal, we could a tale unfold. There is the conceited student, who knows it all far better than the professor—"*Gros Jean qui remontre à son curé;*" there is the awkward student, who cannot put two French words together himself, and is furious at hearing another who can; there is the Englishman with the weak *r*, who asks for pears, and lo! they give unto him peas. There are the thousand and one little things in which foreigners differ from us, and which we find so charming or so amusing. But there is one foreign peculiarity which the British student should imitate constantly and systematically. He should adopt Continental affability, even at the risk of doing violence to his self-contained nature; he should strike up hail-fellow-well-met chats, regardless of formalities. He must cast off the national reserve, which will effectually bar progress in conversation; he must soften down the Anglo-Saxon brusqueness and *hauteur*, which so often irritate Continental people. He must avoid his fellow-countrymen, and aim at passing the

whole month without uttering a word of English; then, on his return, he will jabber his native idiom with as great gusto as the silent monks of La Trappe on their monthly conversation day.

As our tabular page enables intending students to obtain the detailed programmes for themselves, we shall probably



GENERAL VIEW OF TOURS.

use our space most profitably by giving a few *practical hints*, culled from several years' experience of holiday courses in many lands.

A very important point is that the student should choose his destination, study the programme, and decide upon definite aims, *long beforehand*. Without thorough preparation, the results obtained do not repay the student for the labour and expense incurred. At all holiday courses, numerous students are to be found who only understand the lecturer very imperfectly; whereas a few months of hard reading *aloud*, with a weekly pronunciation lesson from a competent teacher, would have cleared away many difficulties. The better we learn to pronounce, the more readily we shall understand; while each bad habit of pronunciation is a stumbling-block in the way of quick comprehension. For instance, the Frenchman pronounces the first syllable of *le*ver or *tue*r very rapidly and glibly. Englishmen often say *lév*-ay, *téw*-ay, and do not recognise the words when correctly pronounced. We would recommend special attention to the French vowels, the nasal sounds, the consonant *r*, *gn* and *ll*, and final *gne*, *ble*, *tre*, etc. Thorough study of the verbs should go hand in hand with constant reading aloud, and in this way one avoids wasting time upon rarely-used forms of little or no practical value. Slow, observant reading is, after all, the chief means of acquiring a foreign language in England; for the opportunities for conversation are but meagre, even in the case of students who can afford to spend money freely upon conversational lessons. But we were forgetting that the aid of the phonograph can now be called in with good effect.

The beginner need not despise the help of a *key*—it has the advantage of saving long dictionary work—but he must aim at self-reliance, which only comes from patient, plucky wrestling with a difficult text, by the aid of brains and dictionary. Constant care must be taken to guard against faulty pronunciation and unwary misconstruction. French abounds with words which have a deceitful resemblance to English, and an often unsuspected meaning. One of the recent questions set at the Society of Arts examinations will serve as an illustration: "Distinguish between *actually* and *actuellement*, *altered* and *altéré*, *concourse* and *concours*, *fastidious* and *fastidieux*." Abundant notes should be made on all foreign reading, with continual comparison and contrast of words and phrases. If these notes are afterwards thoroughly revised, they form rigid *points d'appui* from which to proceed to other difficulties. Each paragraph should be so mastered that it can be read intelligently and fluently *in French*.

The proper stage at which to study the grammar thoroughly is when the student has gained such a hold of the language that he can think of numerous examples of the grammatical rule. If he labours too much and too early at his grammar, he will suffer from bad fits of nausea, which will prevent progress. Constant reading of good literature is bound to lead to success.

In preparing for the holiday courses, it is well to avoid translation, which, though a good test for comprehension of a passage, is not much of an aid. In direct reading, if the student feels that he *must* translate in order to understand, he can eradicate the bad habit gradually by reading the passage several times rapidly in French, until the meaning reaches the mind direct. The habitual use of a dictionary written entirely in French is recommended. Composition, as a constant exercise, is most valuable. In fact, it is slow thinking in French, and leads up to success in conversation. Translation, as a habitual practice, is bad; it hinders the student in his effort to speak, clogs his mind with the trick of thinking in English, and causes absurd slowness and hesitation.

But now a word for more advanced linguists, who are preparing for the higher courses, such as those at Geneva and Lausanne, and who already know the value of the above hints from their past experience. To understand spoken French readily, one must be able to read with facility French newspapers and contemporary literature. This cannot be done without a fairly exhaustive study of Gallicisms, and popular or familiar expressions not found in the usual dictionaries. The following books will be found useful:—(1) For comparison of French with German—*Exercices pratiques sur les gallicismes* (Genève: R. Burkhardt); (2) written entirely in French—*Choix de gallicismes* (Macmillan and Co., London); (3) *Dictionnaire Argot Français*, Georges Delesalle (Paul Ollendorff, 28 bis Rue de Richelieu, Paris). The best German periodical we can recommend is *Die Woche*, from which were taken the extracts for the recent examinations held by the Society of Arts. A useful dictionary, written entirely in German, is *Wenigs Handwörterbuch* (Köln: M. Du Mont-Schauberg).

To conclude, we strongly recommend all linguists who feel themselves sufficiently advanced to spend their next summer holiday in Geneva or Lausanne. It has been our privilege to describe these courses in the pages of this journal, and in reviewing coolly what we wrote in the flush of enthusiasm which follows a happy, well-spent, stimulating holiday, we feel that we need not retract a word of our high praise. We still treasure the interesting correspondence of MM. Bonnard, Maurer, and André of Lausanne, and of MM. Bouvier and Thudichum of Geneva, as souvenirs of the best Continental holiday we have ever had. We note with pleasure that a course of lessons has been organised at Geneva specially for English-speaking students (professor—M. Alfred Dufour).

SCHOOL AT WHICH LAUSANNE HOLIDAY COURSES ARE HELD.

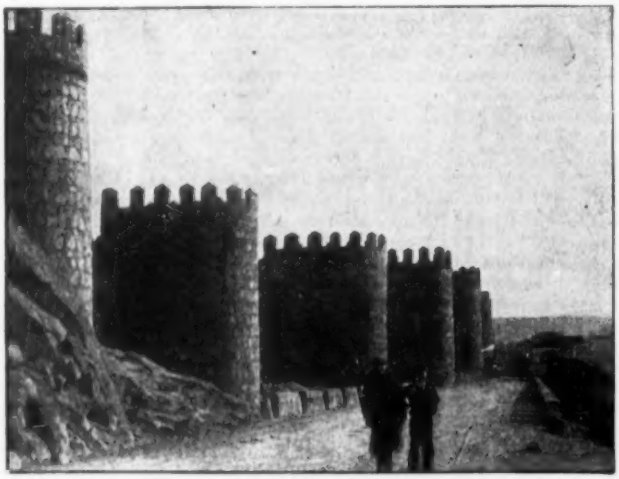
But unless our nation is more liberally represented than in 1899, we can hardly expect this arrangement to be continued.

One of the many good points in the organisation of these Swiss courses is the important place assigned to the study and discussion of the methods of language teaching, and to pedagogic and psychological questions generally. We have

Next Month:

OUR HOLIDAY NUMBER.

before us a memento of our last visit to Geneva—the list of questions for discussion compiled by M. Henri Mercier, who takes the same subject again this year. One or two examples will serve to illustrate the great value of these lectures from a professional point of view:—"1. Comment upon and discuss the dictum of Rousseau that the great secret of education is to make physical exercise serve as a relaxation from mental work, and *vice versâ*. 2. How children learn to speak. 3. School excursions. 4. Comment upon and discuss the following quotations from Rousseau: 'What should children learn? Let them learn what they will have to do when grown up, and not things which they will have to forget.' 5. 'Things! things! I cannot repeat often enough that we give *words* too much power; with our education of babble, we turn out nothing but babblers.'" It may thus be seen that the holiday courses of the universities of Switzerland offer precious advantages to the teacher as distinguished from the ordinary student. In addition to M. Bernard Bouvier's lectures on literature, the programme for the coming summer includes a course on the methods of teaching French (M. L. Zbinden); on French syntax and idioms (M. Henri Mercier); and last, not least, a course of twelve lessons on reading and pronunciation (M. Georges Thudichum).



WALLS OF AVILA, SPAIN.

The following extract from a long and interesting letter which we received from M. Bernard Bouvier will give a still clearer idea of the high aims which these able professors keep so well in view:—"We do not address ourselves to beginners, but to those who, by their previous studies and already sound knowledge of the French language, are in a position to benefit by a few weeks' work here. Our lectures are planned primarily for those who teach French, or who are preparing for the scholastic career. We would make them love their profession more; help them to discover how many facts and ideas, how much of human life and knowledge, are involved in the teaching of a foreign tongue. To vivify, enrich, and broaden the methods of teaching French in foreign lands, by acting directly upon the teachers, that is our aim. You have understood our purpose, monsieur, and have shown in your article that, in order to attain it, nothing is indifferent, not even the study of our folk-songs, the friendly gathering of our conversation groups, or an excursion shared by professors and students in common."

PROGRAMMES AND HANDBOOKS.

The Teachers' Guild of Great Britain and Ireland has just issued a complete programme of their own Special Modern Language Holiday Courses to be held at Tours, Lisieux, Elbeuf, and Avila. These are noted in our tabular page; and those of our readers who may wish for particulars should send six stamps to the Secretary, at the office of the Guild, 74 Gower Street, London, W.C.

The aim of the French Courses (Tours, Lisieux, and Elbeuf) is to promote among English people a knowledge of the language, customs, and ways of thought of the French nation. All instruction will be given in French. Students must have already some knowledge of the written language at least. Those who have little or no knowledge of the spoken language are advised to choose the class of M. Marjault, at Tours; of M. Féquet, at Lisieux; and of M. Godal, at Elbeuf. The other lecturers will speak as slowly as is necessary, but will assume that their listeners are capable of understanding spoken French.

Examinations.—Towards the end of the courses at Lisieux and at Elbeuf, examinations will be conducted by a board of French professors. These examinations will be of two grades—elementary and advanced. Each will consist of two parts—(1) a written composition, and (2) an oral examination. The elementary examination will be intended to test the power of the student to write and speak French, and to understand it when spoken, with fair correctness and facility. The advanced examination will aim at testing the power of the candidate to teach the French language efficiently. Arrangements have also been made by the professors at Tours to hold an examination at the end of the courses for those who desire a certificate of proficiency.

Spanish Course at Avila.—The details of the arrangements in connection with the course at this centre will depend upon the number of students who express their desire to attend; but in any case the services of Señor Martinez, who is a staff instructor at the Normal College, will be again available. He will arrange to meet the students daily, to give them lessons in conversational Spanish, and to accompany them in visits in the town and neighbourhood. Provided that sufficient students signify their intention to attend, an additional teacher or teachers attached to the staff of the Normal College will be available, and in that case social meetings, and addresses in Spanish on subjects of local interest, will be arranged. It is hoped that intending students will send in their names to the Secretary of the Teachers' Guild Committee as early as possible. Full information relating to lectures, journey, lodgings, excursions, etc., is also furnished.

To those teachers and students who contemplate a visit to Avila we strongly recommend a new handbook by E. Main, just issued by Messrs. George Bell and Sons, entitled, *Cities and Sights of Spain*. Hitherto guide-books have told us much of slow railways, bad accommodation, indifferent cookery, unsatisfactory sanitary arrangements, etc., but of these inconveniences peculiar to the Peninsula the author knows nothing; for they belong to "the Spain of yesterday." The book has been compiled after the experiences of three journeys, amounting in all to some 6,000 miles, and no place is described which the author herself has not visited. All possible information is given as to how to get to Spain, and how to see it when there, in addition to much serviceable detail as to luggage, money, tours, railways, hotels, etc. The book is pleasantly written, and enriched by the insertion of many beautiful illustrations. Our thanks are due to Messrs. Bell and Sons for having placed certain of these at our disposal, one of which (the Walls of Avila) we have been able to insert.

The eighteenth annual issue of the Teachers' Guild **Holiday Resorts and Recommended Addresses** has also been opportunely published for the coming holidays. This little book contains many hundreds of addresses recommended by the holiday resorts sub-committee, with particulars as to *en pension* terms and accommodation at private houses, hotels, etc., in all parts of Great Britain and Ireland, the continent of Europe, the United States, Canada, and even in Asia. It is well worth the shilling charged for it, and in view of the immense amount of patient inquiry necessary in connection with the preparation of such a work, we sincerely hope it will have the wide sale it deserves.

M. L. Bascan, Prof. de Lettres à l'Ecole Normale d'Instituteurs at Caen, has also sent us a copy of the prospectus relating to the French Holiday Courses announced by him in our advertisement columns. These university courses, organised under the patronage of the Alliance Française, include morning and evening lectures, the practical study of French phonetics, dictation, reading, conversation, translation from English into French, afternoon excursions, examinations conducted gratuitously by university professors, the delivery of *certificats de Français*, and a free Franco-English correspondence for a whole year between the students and the director.

The courses are open to ladies and gentlemen of any nationality who desire to acquire a knowledge of French for teaching or business purposes. Their special aim is to enable persons to speak good colloquial French, to improve their pronunciation and conversational powers, and, at the same time, to allow them to enjoy three weeks or a fortnight by the seaside in one of the most beautiful provinces of France.—For further particulars, apply direct to Mons. L. Bascan, 49 Rue Caponière, Caen.

EDUCATIONAL HOLIDAY COURSES WITH OUR CONTINENTAL NEIGHBOURS, 1901.

Where held.	Date.	Fees.	Return Fares from London, 1st Class Steamer, 2nd Class Railway.	Lowest Cost of "Pension" per Day.	For further information address:	Principal Subjects, etc.	Important Details.
SWITZERLAND:							
Geneva.....	July 16–August 28.	40 francs, and 6 francs for special conversation classes and correction of written work.	£5, 11s. 1d.	4 francs.....	Monsieur Bernard Bouvier, Bourg-de-Four 10, Geneva.	Classical and Modern French Literature, French institutions. Special classes for study of spoken language, rhetoric, style, syntax, and methods of teaching.	Specially intended for teachers and advanced foreign students of both sexes.
Lausanne...	July 22–August 30.	30 francs.....	£5, 1s. 4d.	4 francs (possibly 3 francs 50 cents).	Monsieur J. Bonnard, Avenue Davel 4, Lausanne.	Literature; Philology; Phonetics. Special study of spoken language. Methods of teaching. French institutions. History.	For foreigners of both sexes.
Neuchâtel..	1st course, July 15–August 10. 2nd course, Aug. 12–Sept. 7.	25 francs / 25 francs	£4, 19s. 6d.	4 francs.....	Monsieur P. Dessoulavy, Académie de Neuchâtel.	General study of French Language and Literature.	For foreigners of both sexes. Elementary and advanced courses.
GERMANY:							
Greifswald..	July 15–August 3.	20 marks.....	Via Hamburg, £3, 7s. Via Flushing—Berlin, £5.	3 to 4 marks.	Ferienkurse, Greifswald (Prof. Dr. Siebs).	German, French, and English Languages, Literature. Methods of modern language teaching. Phonetics, Pedagogy, Natural Science, History, Geography.	For teachers of both sexes. Special conversation classes for foreigners, conducted on most modern methods. All lectures given by University teachers.
Jena.....	August 5–17 (conversation classes continue until August 24).	Entrance, 5 marks. Each course of 12 lectures, 15 or 10 marks. Conversation classes (18 lessons and 6 excursions), 30 marks.	(To Weimar) £4, 9s. 3d.	3 to 4 marks.	Frau Dr. Schnetger Gartenstr. 2; after August 3, Grietgasse 17a.	Pedagogy, Natural Science, History of Art, Mental and Moral Science, Religion, German Language and Literature. Education of defective children.	For teachers of both sexes. Renowned for its course of Pedagogy. Conversation classes (elementary and advanced) for foreigners.
Kiel.....	July 8–27.....	20 marks.....	Via Hamburg, £3, 10s. 6d. Via Hook, £4, 8s. 5d. Via Flushing, £4, 13s. 8d.	2 marks to 2 marks 50 pfennigs.	Herr Nissen, Holtenauerstr. 38.	Pedagogy, Psychology, Ethics, History, Natural Science, Languages, Courses.	For teachers of both sexes. Arrangements will be made, if desired, for conversational classes for foreigners.
Marburg....	1st course, July 7–27; 2nd course, August 4–24.	30 marks for each course; or for both, 45 marks.	£3, 15s.	2 marks 50 pfennigs to 4 marks 50 pfennigs.	Herr A. C. Cocker, Villa Cranston; or W. G. Lipscomb, Esq., Hon. Sec., Modern Language Association, University College School, London, W.C.	Pedagogy, History of German Language, German Literature, Modern History, History of Art, Phonetics, German, English, French, English and French Literature, Modern Language Teaching according to the New Method.	For teachers of both sexes. Conversation classes (elementary and advanced) for foreigners.
SPAIN:							
Avila.....	August 5–25.....	30s. to £2 for the course.	Via Paris, Bordeaux, and Irun, £9, 4s.	27s. a week..	H. B. Garrod, Esq., 74 Gower Street, London, W.C.; or J. Turner, Esq., County Technical Offices, Stafford.	Spanish Language and Literature.	Visits to places of interest in the neighbourhood. Conversation classes.
FRANCE:							
Tours.....	August 1–22*....	£2, 2s., if name is entered before July 15; otherwise, £2, 5s.	(To Paris) £2, 10s. 3d. (Paris to Tours) about 14s. 6d.	6 francs.....	H. B. Garrod, Esq., 74 Gower Street, London, W.C.	French Literature, History, Language. Political, social, and economic aspects of France.	Under management of special committee appointed by the Teachers' Guild. To promote a knowledge of the French language, customs, etc., among English people.
Lisieux.....	August 1–24*....	As above.....	£1, 18s.	5 francs.....	As above.....	As above.....	As above.
Elbeuf.....	August 1–24*....	As above.....	£1, 16s.—that is, 33s. to Rouen and back, thence book to Elbeuf.	As above	As above.....	As above.....	As above.
Paris.....	1st course, July 1–31; 2nd course, August 1–31.	100 francs admits to both courses; 60 francs to all the lectures of a single course. Each lecture, 1 franc. Each conversation class, 50 centimes.	£2, 10s. 3d.	As above	Monsieur le Secrétaire, L'Alliance Française, Rue de Grenelle 45.	Classical and Modern French Language and Literature, Elocution and Pronunciation. Phonetics. Institutions and Arts of France.	Elementary and advanced courses. Special courses on history of French art and institutions. Conversation classes.
Paris.....	Christmas and Easter Holidays.	25 francs per week.	As above.....	As above	Monsieur Louis Jadot, Université Hall, Boulevard Saint Michel 95; or W. G. Lipscomb, Esq., Hon. Sec., Modern Language Association, University College School, London, W.C.	Study of French in groups of three or four. Visits to places of interest in Paris; also lectures on Literature, Art, Educational and Social Life of Paris.	Preparatory to summer courses of L'Alliance Française, and to the examination for the certificat d'études françaises de l'université de Paris.
Grenoble....	July 1–October 31.	30 francs for the first six weeks, and 10 for each subsequent fortnight; or 50 francs for the whole course.	(To Paris) £2, 10s. 3d. (Paris to Grenoble) £2.	4 to 5 francs (possibly 3 francs 50 cents).	Monsieur Marcel-Reymond, 4 Place de la Constitution.	French Language and Literature. Elocution and Pronunciation. Phonetics. Special study of spoken language. History of Art. Political, social, economic aspects of France.	Visits will be made to places of interest in the mountains of Dauphiné for foreigners of both sexes.
Nancy.....	Dec. 1–April 1, and August 1.	40 francs for 40 lessons in elementary course; 20 francs for 20 lessons in advanced course.	(Paris to Nancy and back) £2, 3s.	4 to 5 francs..	Monsieur I. Gavet, Rue des Tiercelins 46.	Classical and Modern French Language. Literature, History, and Institutions of France.	Preparation for the examinations of the Alliance Française.
Caen.....	April 9–July 1 or 30; August 1–30.	£1 for one week, £1, 12s. two, £2, 4s. three, or £3 for one month.	£1, 12s.	5 to 6 francs..	M. Lebonois, 7 Rue Neuve-Bourg, L'Abbé; or Walter Robins, Esq., 9 Northbrook Road, Lee, S.E.	French Language and Literature. Political and social aspects of France. Special study of spoken language.	For foreigners of both sexes. Conversation and reading classes.

Notes.—Programmes of most of these courses may be seen at the Education Department Library, Cannon Row, Whitehall, S.W.

* These dates are given subject to alteration; the exact dates will be found in the Teachers' Guild Handbook, to be published at the beginning of May.

THE CHILDREN TO THE MOTHER.

MR. SADLER ON COLONIAL SCHOOL SYSTEMS.

VOLUMES 4 and 5 of Mr. Sadler's Special Reports on Educational Subjects will intensify the feeling of just pride with which we stay-at-homes are wont to regard our kith and kin of the Greater England beyond the seas. Sixteen hundred pages of condensed matter tell the tale of the colonist's zeal for education, and in every line of the stirring story we see him devoting mind, money, and time to the problem of placing a liberal education within the easy reach of one and all. Many are the lessons that the over-complacent motherland may learn from her more enlightened children, and the only disquieting feeling we experience in welcoming Mr. Sadler's well-told history of colonial educational development is one of fear lest its great length should debar us from doing full justice to the recital. Taking the systems in order, we will endeavour to show in what respects they are superior to our unhappy system of chaos and muddle.

I.—ONTARIO.

Sturdy Self-dependence.—At the very outset we are attracted by the claim to originality set out by the Deputy-Minister of Education—Mr. Millar—especially as we find, upon examination, that the originality is all in the direction of common sense. "Ontario," he says, "may claim to have some features of her system that are largely her own. Among them may be mentioned:—A division of state and municipal authority on a judicious basis; clear lines separating the function of the university from that of the high schools, and the function of the high schools from that of the public elementary schools; a uniform course of study; all high and public schools in the hands of professionally-trained teachers; no person eligible to the position of inspector who does not hold the highest grade of a teacher's certificate, and who has not had years of experience as a teacher: the acceptance of a common matriculation examination for admission to the universities and to the learned professions; a uniform system of text books for the whole province; the almost entire absence of party politics in the manner in which school boards, inspectors, and teachers discharge their duties; the system national instead of sectarian."

Local Authority.—The ministry of education delegates certain powers to local authorities who are thus referred to in the report:—"The province is divided into counties, which are subdivided into townships, incorporated villages, towns, and cities. Through their municipal councils counties are under obligation to make grants of money to high schools, and both counties and townships must aid public schools. Each township is divided into school sections, each provided with a public school. There is a **board of trustees** for each school section—village, town, or city. The greater part of what is expended for public schools is provided by the school section, town or city. The ratepayers (men and women) elect the trustees, who appoint teachers, and determine the amounts to be expended for buildings, equipments, and salaries."

Attendance.—Since 1891 this has been compulsory, and penalties are inflicted, unless the child is absent through sickness, or is excused by a justice of the peace or the principal of the school. Truant officers, vested with police powers to enter factories and other places where children may be employed, must be appointed in every school district, and they report annually to the Education Department.

Inspectors.—All schools, of whatever class, are subjected to a thorough inspection at the hands of competent men, for only teachers who have by ability and application gained a reputation in their profession, can aspire to the inspectorate. The silly English fashion of appointing non-teachers as inspectors is quite unknown here, as elsewhere in the colonies. Moreover, the duties of the inspectors are those of the expert adviser, who in a sympathetic spirit takes stock of discipline, methods, and apparatus only to ensure that they shall be of the best.

Teachers.—There is no teaching of children by children in enlightened Ontario, nor is there any place for the Article 68. "Every position, from the lowest in the kindergarten to the highest in a collegiate institute, must be filled by a trained teacher." No teacher of a high or public school receives a permanent certificate who does not possess qualifications of a threefold character—(1) scholarship; (2) pedagogy; (3) success shown by actual experience. Moreover, teachers are not herded apart from other professional people during the period of training. They consort with the budding lawyer and clergyman on equal terms, and only after having obtained a liberal education are they admitted to a training institution, the curriculum of which we should like to quote, so full of sweet reasonableness is it, did not space forbid. Certainly the trained teacher of the land of the beaver and the maple has more to be thankful for than has his less fortunate English compeer.

Promotion.—From what has already been said, it will be seen that the teacher of Ontario has a real career open to him. It depends very much upon himself whether he advances to the position of secondary teacher, or even to that of inspector. Class distinctions do not block the way as in caste-cribbed England.

Curriculum.—The public school has five separate classes, for each of which there is a fixed curriculum, duly set out in an appendix to the report. It includes the following subjects:—Reading, Writing, Arithmetic, Grammar, Geography, History, Drawing, Music, Physiology, and Temperance. There is a Leaving Examination each year, held at the same time as the High School Entrance Examination. Every pupil in the Fourth and Fifth Form of rural schools is now required to give attention to agriculture, which is taken under the guise of nature study, and a specialist may, under the Act of 1899, be employed for this work. Manual training is also an optional branch of study for both high and public schools. On this we read that "instruction in elementary science, freehand and geometrical drawing, modelling in clay, etc., may be made to incite a love for self-activity;" and "instruction in manual training will cultivate the perceptive faculties, will create love for manual skill, dexterity, and taste for design. It will induce young persons to observe for themselves, to acquire knowledge at first hand, and to be self-reliant." The high school curriculum includes all subjects necessary for matriculation at the university.

The religious difficulty is unknown in Ontario, where "the great majority of the people believe that schools and colleges should be non-denominational. No religious body has any voice in the management of the high and public schools, or of the university." Yet "the co-operation of the clergy of all denominations in educational gatherings is quite common, and recognition of religion is fully shown in the regulations."

Separate Schools.—It is provided that any number of heads of families, not less than five, being residents of the place, may unite and establish a separate school. They are exempted from the payment of rates towards the public school, their contributions being devoted to the separate school to which they are attached. Such schools are mainly confined to Roman Catholics, there being only eight Protestant separate schools in existence in 1898.

Fee or Free?—All public schools are free. "All persons are taxed to support education, because its general diffusion is for the public good. It is held that compulsory education is a natural corollary of free education," and *vice versâ*. As to the high schools, they may be free or fee schools at the option of the locality. Of the one hundred and twenty-eight high schools and collegiate institutes, forty-eight are free, the rest charging a fee of from 2.50 to 26 dollars per annum.

Technical and University Education.—Respecting this part of the report, we need say no more than that the same intelligent enthusiasm is instinct in the regulations governing them as in those referring more especially to primary education. Provision is also made for the teaching of the deaf and of the blind, so that no section of the community is ignored in the well-thought-out scheme of which the province is legitimately proud.

Empire Day.—May 23rd is set apart not as a holiday,

but as a day upon which the teachers turn the thoughts of the children more pointedly to the cult of strong, intelligent, and comprehensive patriotism, and "it is satisfactory to know that in no instance does there appear to have been any desire to cultivate what is termed the 'jingo' spirit." There is, of course, a holiday on the 24th of May.

Teachers' Institutes.—For thirty years the Educational Association of Ontario has been in existence. It meets every Easter for the consideration of papers referring to questions of educational interest. The Legislature makes a grant of 200 dollars per annum to the association, to which belong all classes of teachers, and which divides itself into sections for kindergarteners, public school teachers, high school teachers, training school teachers, inspectors, and so on. In addition, each inspectorial district has its local association, to the support of which the Legislature and the local authority each make a grant of 25 dollars per annum.

The School Beautiful.—The school authorities of Ontario claim to have been the first to insist upon the beautifying of the school walls with pictures and other mural decorations, a fact which speaks volumes for the sagacity of the conscript fathers of the Lakes Peninsula.

II.—QUEBEC.

Authority.—The report on Quebec devotes much space to a description of the Department of Instruction, which is the name given to the staff appointed to assist the Superintendent of Education and the Council of Public Instruction. The superintendent is appointed by the Lieutenant-Governor, and has to carry out such regulations of the Council as have been approved by the Governor. The Council comprises a Roman Catholic and a Protestant wing, each devoted to the work of safeguarding the interests of their co-religionists, which appears to be done to the satisfaction of all parties concerned. The local authorities are called **School Corporations**, and the area over which they preside is known as a **Municipality**, which is simply a name for a school area, which, again, is subdivided into **school districts**. The school corporation is an elected body, which is entrusted with the imposition of the school rate. The **Dissentient Schools** of Quebec correspond with the separate schools of Ontario, and they owe their existence to the desire to give fair play to the denominations.

Inspector.—No person can become school inspector unless (1) he is twenty-five; (2) has obtained a diploma for teacher; (3) has taught for five years; (4) has discontinued teaching at least five years (this condition is difficult to understand); (5) has been examined as to his fitness and ability to fulfil the duties of the office. He has to examine the schools, the teachers, and the buildings, to inspect accounts, and to see that all the regulations are kept. In the Protestant schools "public oral examinations are to be held from time to time," and "written examinations shall be held annually, or oftener, as the Board may direct," so that apparently the examination fiend has the schools of Quebec still within his grip. In addition to the inspectors, certain visitors are appointed, and they have the right of entry and inspection. They consist mainly of clergy and militia officers.

Teachers.—Untrained and even uncertificated teachers are allowed to teach in the schools of Quebec. As a mild set-off against this lack of training, the inspector is occasionally told to forego his school duties for a season, and to convert himself for the nonce into a professor of pedagogy. In each district he gives a two days' course of pedagogical lectures, which all teachers must attend, their schools being closed for the purpose, and teachers from a distance being paid 75 cents *per diem* for expenses. In the return for 1897–98, 403 teachers of all classes were returned as uncertificated; no information is given as to the number untrained.

Religious Difficulty.—Notwithstanding the fact that all schools are denominational, there is no friction in respect to religious instruction. Each denomination restricts its attention to its own schools, and the *curé* of each parish has the right to select the books to be used in his district in instruction in morals and religion. It is in its triumphant mastery of the sectarian question that Quebec seems to have achieved its greatest success.

Fee or Free?—There are no free schools. The fee may not in any case exceed 40 cents, nor fall below 5 cents (2½d.) per month, except at the discretion of the trustees, who may diminish these amounts according to the means of the parents, the ages of the children, and the course of instruction. Exemption is also granted for insane, deaf or dumb children, and for those educated away from the municipality.

Particulars are added respecting (1) the Roman Catholic Laval University at Quebec, and its branch at Montreal; (2) the Protestant M'Gill and Lennoxville Universities, and various secondary schools.

III.—NOVA SCOTIA.

Authority.—The school section is the unit school area. It is governed by three school trustees, one of whom retires annually, when his successor is elected. In towns the trustees are called Commissioners, three being appointed by the municipal council and two by the provincial government. In Halifax the number of commissioners is twelve. The superintendent is appointed by the Governor, and functions broadly as a Minister of Education.

Attendance.—Modified compulsion is in force. Every year each school section must vote "yea" or "nay" as to the adoption or rejection of the law of compulsory attendance; but, once adopted, it must remain in force. A minimum number of 120 attendances is insisted upon, and a fine of two dollars may be imposed at the end of the year if this minimum is not reached.

Inspector.—The inspector is vested with plenary powers, he being the direct representative of the Council, by whom he is appointed. That he should have been a teacher himself is not stated.

Teachers.—In 1898, 30 per cent. only of the teachers had been trained in a normal school; the rest had passed an examination in teaching and school management. The teacher very frequently gives up his school for some other (presumably more profitable) occupation. Women are rapidly replacing men.

Curriculum.—This is well thought out, and includes "Nature Study" (for agriculture), Patriotism, Geography and History, and (at option) Manual Training. School books are prescribed, and are therefore all of one type.

Religious Difficulty.—In all schools "religion and Christian morality" are taught, and denominational schools may be rented by religious sects, who may appoint the teacher, whose salary will, notwithstanding, be paid by the trustees.

Fee or Free?—The schools are free; moreover, in Halifax arrangements are in force for feeding such of the children as stand in need of this help, the agency being voluntary, although members of the Board of Commissioners give the movement their countenance and assistance.

Secondary and Technical education are well attended to, one special feature being the existence of Schools of Mines, whence mine-managers must obtain a certificate of competency. Altogether, the system of education in vogue is not unworthy of the older Scotland, to which Nova Scotia evidently went for inspiration. This report is one of the very best of the series.

A NEW JUVENILE CANTATA.

At the Wilfrid Lawson Hall, Woodford, during the Shakespeare Memorial week, a special performance was given of Mr. Thomas Murby's new juvenile dramatic cantata, entitled *Shakespeare's "Merrie Meeting."* The evening was a thoroughly successful one, and Mr. Murby (conductor) and his daughter, Miss Helen Murby (piano), won the applause of all present. As our readers are aware, Mr. Murby is well known as the author of several charming cantatas for children, all of which have enjoyed the high praise of the leading organs of the press for their simplicity, beauty, and suitability. The "Merrie Meeting" is as delightful as it is clever. It includes six scenes and twenty-two characters from Shakespeare. Teachers seeking something new should not fail to examine a copy of the work, which is issued at 2s. by Mr. Murby, at his publishing office, 3 Ludgate Circus Buildings, London, E.C. The fullest particulars as to costumes, chorus, etc., are, of course, furnished in the edition referred to.

FROM MONTH TO MONTH.

BY MANY HANDS.

"Quot homines, tot sententiæ."

IT is the sad truth that the people of England do not care a straw for education, and apparently the Duke of Devonshire and Sir John Gorst are in the same unhappy condition of infidelity. Hence it seems impossible to say whether the present educational gloom is merely the darkness that precedes the dawn, or the menace of impending dissolution. Nor does the Board of Education's emasculate Bill, with its brood of "ifs" and its forgetfulness of primary education in general, and of voluntary schools in particular, substantially lighten the gloom. And yet the way out of the chaos is so simple, if but a transient wave of educational enthusiasm could arise in the minds of the nation, and especially of those who should be its leaders. This is clearly shown by Mr. Cloudesley Brereton, in an article contributed to the May *Fortnightly Review*, which not only advocates the compulsory and immediate absorption of School Boards by the County Councils and County Borough Councils, but also the financing and control of all grades of education by the county authorities. Should the practical teacher look with apprehension upon the improvement of the School Board off the face of the earth? We trow not. Granting that the larger School Boards have done yeoman service, this is more than overshadowed by the obscurantist pettifogging that has been characteristic of the small School Board, as teachers up and down the country know to their cost. Let them go down to Tophet, as Carlyle would say, and let the county authority, free from local pettiness, take under its fostering *ægis* all schools—Voluntary, Board, Technical, and Secondary—and a new era will dawn for English schools, for English practical teachers, and for England herself, as Mr. Brereton clearly shows; and if dementia has not seized upon England, as a prelude to decline and destruction, the near future must see the accomplishment of this consummation so "devoutly to be wished."

"Quem deus vult perdere prius dementat."

* * *

THE unfortunate Gulf Stream appears to be in danger of sharing the fate of Julius Cæsar as lamented by Mark Antony, for, says Mr. H. M. Watts in the United States *Monthly Weather Review*, among those who are really acquainted with the actual facts rather than with the "Gulf Stream myth," there are none so poor as to do it reverence—or words to that effect. Upon the climate of Europe, says Mr. Watts, the Gulf Stream has about as much effect as the fly in the fable had in carrying the stage-coach up the hill. Compared with the prevailing winds, the Gulf Stream is "an unconsidered trifle," which may be relegated to the oblivion merited by its supreme unimportance. The pendulum has come full swing with a vengeance! It is the prevailing winds to which our reverence must be paid in future, for to these is due the fact that "the entire surface of the Atlantic Ocean north of the region of the trade winds" is drifted to the north-east, "which drift, and not the ocean currents, carries the beneficent influences of the ocean over the European islands and the shores to the east and north-east."

"The Gulf Stream Myth."

It is not at all clear from the article what Mr. Watts's views really are as to the exact manner in which "the prevailing eastward and north-eastward drift of the circumpolar atmospheric circulation" effects the results attributed to it. Just *how* and *why* the climate of Europe is milder by many degrees than it has any right to be by virtue of its latitude is left to the imagination of those school teachers by whom the Gulf Stream "is still referred to in a familiar, offhand manner," to say nothing of the "writers who ought to know better."

This question, however, is dealt with in our article upon "The Gulf Stream," written before the publication of the views advocated by Mr. Watts, which appears elsewhere in our columns.

* * *

IN *The Westminster Review* for May, Mr. Christopher C. Dove sets himself to answer the question, "Is the sense of duty the offspring of self-love?" His answer is marked more by earnestness of purpose than by clearness of expression, and will be most convincing to those who are already in agreement with the writer.

A Question of Morals.

The "plain man" may be startled at seeing such a question asked. He assumes that duty implies *duty to others*. If he is pressed to say *why* he should do his duty to others, the chances are in favour of his giving some reason, based either on old religious doctrines or new scientific ones, which leads him into an unexpected corner. Either regard for his own future is the ultimate reason, or he falls back on inherited tendencies, acquired in the course of a more or less hypothetical struggle for existence. Yet somehow the plain man feels that there is some objective standard of duty, some "categorical imperative," independent of him and even of his ancestors. And the plain man is right—but to prove him so is "another story."

* * * * *

Is benevolence, after all, a form of selfishness? It was so asserted by Bentham, and has been by many since. Bentham explains his benevolence by saying that in his own case selfishness takes that form. Would it were oftener so! But, seriously, should grave philosophers, even for the sake of a pet theory, describe one thing by two contradictory terms? Then we can only try to play the game in the same way, and reply that in *our* case benevolence takes the form of selfishness. We know that society as such cannot experience happiness, but only its individual members. We also feel it our duty to increase the sum of human happiness. Our method is simple. Like charity, we begin at home. We know our own tastes and feelings so well that we can minister better to our own happiness than to that

of another. So we increase the sum of human happiness by increasing our own. That takes up all our time. If everybody else does the same, society will be happy, and the aim of benevolence will be accomplished. *Explicit ratio.*

* * *

Education and Mediocrity.

THE old question has been cropping up again as to whether our inadequate supply of great men is not due to the fact that we train the young in one groove. There is great need for definition of terms in discussing such a problem. Can any two men train the young in exactly the same groove, or does the individuality of the teacher count for nothing? What is a great man? Does it merely mean one who is bigger than his neighbours? And, after all, is it our supply of great men that is inadequate, or is it our supply of good average middle-sized men who can make use of the great men's leading? And so on.

On the whole, it seems to be the "number two size" man that is most deficient. It does not need the commander-in-chief to originate a disaster; this can be brought about by the blunder of a subordinate. Art and literature suffer from the incompetence of the rank and file rather than from the absence of masterpieces; —but here, perhaps, the critics of the "groove" would have all literature and art to consist of masterpieces, or blame the training. The field of invention is sometimes searched to show that many of our great men were outsiders as regards the trade to which their invention applied. Before we could strike a balance here, we should also sum up on the debit side the thousands of inventors who have spent years in evolving apparatus which had been, unknown to them, invented and used for many years already. The "groove" has its advantages even here.

Perhaps the worst of the many ambiguous terms in the problem is the word *train*. Training surely implies a system, a groove. But—and here is the other side—it also implies *training;* and if a boy has been really *trained*, and is not stunted anywhere for want of training, he bids fair to become a useful man of the "number two" size at least, and will suffer from no artificial disability in striving to reach "number one" size.

* * *

Science and Ghosts.

ANDREW LANG'S criticisms in the daily press on Dr. Andrew Wilson's theory of hallucinations are more than entertaining; they express the feeling of a good many non-scientific men that science is not treating us fairly in this matter. Mr. Lang says that science considers it her duty "to offer a theory of false appearances which she can readily explain, but must on no account examine those which present a difficulty." Explain what you can't deny, and deny what you can't explain, seems to be the motto. We could forgive science the want of explanation; what we cannot so easily forgive is the want of investigation. Give a phenomenon a bad name, be it sea-serpent or spirit-rapping, and it may "go hang" so far as respectable science is concerned. There may be more evidence to establish its existence than would suffice to warrant a verdict of Guilty on the capital charge in any court of law; still, science will not be so unprofessional as to admit it among the ranks of scientific phenomena. What we laymen want is a few scientists with no reputation to lose, or with no fear of losing their reputation, so that the ghost and kindred phenomena may be either investigated with some chance of their establishing a *locus standi*, or else decorously and becomingly explained away.

* * *

A French Grumbler.

YOUR grumbler is sometimes amusing. One of the breed has been relieving his soul in the *Manuel Général* on the number of things that are forbidden in France. Everywhere he sees nothing but "*Défense de.*" Not a recommendation or a gentle hint "that one had better not," but the brutal, imperative, "You are forbidden." Our poor grumbler finds his life hedged about with interdictions, and suffers an eternal nightmare of forbidden fruit. He goes to a railway station: ticket, carriage, platform, waiting-room, danger-signal, carriage window—in fact everything—sports his bugbear, "It is forbidden." He takes an omnibus: repetition *ad nauseam* of the customary command. He can only get up or down, sit or stand, under fear of that haunting expression "*Défense de.*" Of course, when he goes to the "Zoo," he has no intention of poking up the animals; nor of plucking the flowers, nor of treading on the grass borders in the parks; nor does he wish to use his umbrella as a pointer when "doing" a gallery or a museum: but it vexes his righteous soul to find that he is "forbidden" expressly to do any of these things. Indeed, in a fine burst of irritation, he declares that everything seems forbidden—except the *tip*. There we sympathise. We too long for the day when "tips" will be strictly forbidden. On that happy day there will be no grumblers, we promise him (at least in England), against a new interdiction.

* * *

And English Politeness.

HIS conclusion is all in our favour. Why is it that fewer things are forbidden in England, and even in military Germany? Or, at least, when things must be forbidden, why can't the French imitate the gentle persuasiveness of the English directions? We are under the impression that there are plenty of "forbiddings" to be found in England, and we fear our grumbler has mistaken the curt injunction, "Wait till the train stops," or "Keep off the grass," for specimens of British politeness. Certainly the form is varied, but the spirit is there all the same. It is, doubtless, pleasanter to be requested than to be forbidden—the element of compulsion is less felt—but, nevertheless, our list of interdictions would be a pretty long one if written out. And we have, in our own pilgrimages across Germany, been much struck by the frequency of the "*verboten*," to which is usually added, with true Teutonic practicalness, "under five marks' penalty." It has made us, on more than one occasion, feel like paying down five marks and then taking out their value in a right royal time with the "*verboten*" thing.

No, *mon cher monsieur*, untrammelled liberty is not yet the order of the day on this side of the Channel; and when your knowledge of our crabbed English speech is deeper and more intimate, you will recognise that "Stick no bills," and "Man-traps and spring-guns," are not the last expressions of formal politeness, but merely the Britannic equivalent of the eternal "*défense.*"

* * *

Fear or Superstition?

WHAT is it that makes people tacitly agree never to mention directly the last act of life—death—if it can possibly be avoided? Whatever the secret of the repulsion may be, it undoubtedly exists, and has always existed. Just as the old Greeks called the Furies the

"Graceful Goddesses," and the Romans had their euphemisms for the act and article of death, so have moderns accumulated a store of significant phrases and terms by which the mention of the act and the thing can be avoided. We have a sufficiency of such phrases and terms in English, but I was struck by the number of phrases to be used in place of the verb "to die" given the other day by a French writer. As he pithily remarked, there are many ways of dying, and almost as many ways of saying it. He made out a list of fifty-six different idioms, in none of which does the actual word "to die" appear, all of which are in common use. And he omitted, to my knowledge, quite a large number of phrases, some of them slangy, but others of them good racy French, all in use for the same purpose. They vary from simple verbs like "to be extinguished," through metaphorical expressions like "to be cut down" (*fauché*), and cribs from the classics such as "to go down to Pluto," or "to cross in Charon's boat," up to philosophical obscurities like "to seek the great perhaps," and "to set out for the great unknown." As for the simple nouns which are used in place of death, their name is legion.

The whole question of the universal use of euphemisms in this connection is quaint and interesting, and throws light on the psychology, not only of individuals, but of the race.

DURING the last few years there have been published in France quite a number of books on educational topics, not confined in their scope to France, but taking in the world at large, or, at any rate, the great nations which compose the most imposing part of it. Keen observers, these Frenchmen, with a clearness of logic in their conclusions that makes their books always interesting, and often very instructive. One of these travelled observers, M. Pierre de Coubertin, has just published his *Notes sur l'Education Publique* (Hachette), containing the results of his impressions of many European and some American nationalities. It is an eminently readable book, and one that will suggest many lines of thought to the Anglo-Saxon reader; for Anglo-Saxon institutions viewed through Latin spectacles have a startling way of getting out of their usual perspective, and presenting themselves in a new and unwonted light.

A Lynx-eyed Latin's Observations

What M. de Coubertin has set himself to do is to investigate the effect of the great rise of the democracy on education in every form. So, beginning with the state and the family, he passes in review primary, secondary, and special education; physical instruction, which he treats under sport, military and hygienic gymnastics; social, moral, and religious education; with a passing glance at universities, the feministic movement, and art in the school. Nothing has escaped his lynx eye, and on everything he finds something good to say, although one may not always agree with him. His conclusions can only be hinted at here, and even then only in part; the interested student must go to the book itself for the rest.

He notes a curious double tendency of the present day. On the one hand, the state is everywhere interfering more and more in the work and systematising of education; and, on the other, the family is asserting its rights, as seen in the spread of the *externat*—that is, the day school—as against the *internat*, or boarding school.

ON the primary school question he offers a pertinent criticism. The agitation, says he, is not religious, but political. "Whether you examine the question in Austria, in Russia, or at the Antipodes, you will carry away the very clear impression that wherever folk may fight for the possession of the primary school, religion may serve as a façade, but politics will be the real cause of the conflict."

On the "Pedagogic Phylloxera,"

How is this to be remedied, think you? By allowing women to monopolise the teaching profession! They do not vote, hence their fitness. This is a startling deduction from French and American ways; how it would apply in England is a dubious point.

Secondary education is everywhere passing through a crisis, suffering from what M. de Coubertin calls a "pedagogic phylloxera." He traces the trouble to the overcharging of programmes, brought about by slavish devotion to science, and leading to systematic overpressure—a failure that is to be laid at the door of the encyclopædic method of secondary instruction. Whereupon, with a *verve* that is surprising, he traces a plan of study, an analytic plan, which shall embrace all the general information the ordinary person needs, by developing the two notions of "the earth" and "man."

This is a brilliant *tour de force* worth reading for itself, quite apart from any practical scheme of education, with which, indeed, it has but slight connection. In the same vein, when he attacks the question of physical education, he gives an admirable *résumé* of the history of sport through all the ages, following it with an inquiry into the psychology of sport, which is, so far as I know, quite a new contribution to the subject.

As for social education, he looks with a longing eye on the impetus given by Anglo-Saxon ways to early training in self-government, in the shape of athletic, literary, debating, and other societies, in which public school life abounds. Even in France, however, this sort of thing has taken root, and is fast developing.

I CANNOT follow him into all his investigations; one or two more must suffice. The institution of regional universities is the natural consequence of democratic action, making the modern university an "autonomous intellectual city," free from the influence of authority. This feature is, perhaps, best seen in France, where the university system has but just shaken itself free from the cramping influence of a central authority imposed by the first Napoleon; but we can note it also at home in England.

And on Feminism.

The "advanced women" will join issue with him at once on the topic of women's education. He thinks, in all seriousness, that "feminism" has only *injured* women's position, because, though not always avowed, the dominant idea of feminism is "the struggle against man!" As for co-education, that is all very well in the primary school; it is *folle imprudence* in the secondary establishment, and in the university it produces a very anomalous condition. In mixed universities (in America) "exuberance is banished; the point of view is faded, lacking in colour; scientific aridity is pushed to an extreme, as if it constituted a refuge against the flight of imagination; students bury themselves in facts from fear of ideas!" How will Cousin Jonathan like that? Personal experience of co-education in England hardly bears out the picture drawn by our lively French critic. M. de Coubertin's book will supply the reader with some original views on a well-worn subject, seen from the standpoint of a highly-educated and acute Latin.

N.U.T. NOTES.

BY ALLEN CROFT,

Vice-President of the National Union of Teachers.

The "B. and O." Council. THE newly-elected Council of the Benevolent and Orphan Fund of the N.U.T. held its inaugural meeting, quite fitly, in the magnificent Board Room attached to Bolton House, part of the Union's new offices. A hasty glance round the assembly revealed a large number of new faces; and a corresponding proportion of old and familiar ones was, of course, missing. The insane craze for "Geography *v.* Brains" (as some one once put it) was partly responsible for the non-success at the polls of Misses Ansell, Carter, Hawley, and Young; Mrs. Polkinghorne; Messrs. Baxendale, Hale, Le Manquais, and South. But the capacity and calibre of those who have replaced them are not to be denied; and one has every confidence that Miss Dix, and Messrs. Brenchley, Hone, Murray, Stollery, Tutt, Thomas, and G. S. West will justify all the good opinions formed of them by their constituents. New blood is frequently efficacious in a popularly-elected body, and most of us derive some modicum of benefit from an occasional defeat at the polls. Next year, moreover, the old system of election will be reverted to, and then, *nous verrons!* A splendid start was made by the unanimous selection of Mr. C. W. Hole as chairman for the year. Mr. Hole's unwearied and devoted labours on behalf of the funds need no eulogy here, whilst his personal qualifications for the office are indisputable. Ready, tactful, courteous, and dignified withal, Mr. Hole will maintain the high traditions followed by a long line of worthy predecessors. His strenuous mode of speaking (which I like for its *soupçon* of hyper-nervousness) will appeal irresistibly whenever he has to act as the Council's spokesman. Two excellent candidates were suggested for vice-chairman, and the Council honoured itself by recalling the veteran Mr. B. South to the scene of his former beloved labours. Mr. T. G. West has the satisfaction of knowing that his turn cannot be much longer delayed. The clearing off of routine business, and the making of adequate preparations for the year's work were the remaining features of the day's proceedings.

At Russell Square. With the single exception of Mr. Clancy, every member of the Executive was in his (or her) place when the president's bell sounded at 10 a.m., the first Saturday in May. It was as unusual as pathetic to have no longer with us the almost revered presence of Mr. Robert Wild, whose ripe experience and sound judgment have been at the disposal of his fellow-teachers for the past thirty years. Perhaps, as Vice-Chairman of the Education Committee, whose deliberations he presided over year by year with never-failing patience, courtesy, and skill, it was my privilege to see and know more of Mr. Wild's strenuous efforts to better the lot of both child and teacher than any other member of the Executive. His high ideals and noble aspirations will ever shine like a beacon-light, an illumination and constant encouragement to those of us left behind to follow, *longo intervallo*, in his steps. At the outset, Mr. Blacker—far from well, I fear, but courageous and indomitable as of yore—welcomed in a few happy words the six new members—Miss Selvage, Messrs. Harris, H. Lewis, R. N. Lewis, Maguire, and Wright—all of whom have a long and honourable record of Union work behind them. Miss Selvage briefly thanked the president on behalf of all six, and very modestly expressed her delight at being back to the scene of her former labours. One of the results of the recent election is to increase the number of "truly rurals" by two. A little cohesion, and possibly the extinction of absurd personal jealousies, would do much to raise the position of rural education generally. Years ago I laboured under the delusion that the certificated class teachers were the helots and pariahs of the profession. Yet their position is immeasurably superior to that of the majority of rural head-teachers in England and Wales. They are better paid, their surroundings are more congenial, and their conditions of service infinitely less irksome than those of their country brethren. My old friend, Mr. R. N. Lewis, who has won his spurs in other branches of public life, will be a tower of strength to their cause; and a few friendly *causeries* should ensure the most cordial of understandings, and the elaboration of a definite and practicable plan of campaign. That their success will be directly proportional to their zeal and enthusiasm, I have very little doubt.

Great Changes. During the past twelve months there have been no less than *eleven* Standing Committees of the Executive, and it has been almost impossible, for a variety of causes, to satisfactorily perform the work. So serious did the position become that shortly before Easter a Special Committee, consisting of the eleven chairmen and the officers of the Union, was appointed to prepare a scheme for the material reduction of the number of Standing Committees, and after long and anxious deliberation they came to an almost unanimous decision on the matter. The work of the old Voluntary Schools Committee will now be taken over by the new Education Committee; that of the Superannuation Committee—where Mr. Ellery has rendered magnificent and invaluable service—by the Parliamentary Committee; that of the Rural and Small Schools Committee by the Education Committee; and the work of the Ladies Committee will be dealt with partly by the Organisation and partly by the Education Committee. Much is hoped from this rearrangement. In addition, members will now be allowed to sit on only *three* Standing Committees, as against *four* last year, and this is surely a step in the right direction. Possibly, if they sat on *two* it would be still better. The new Standing Committees and their officers are as follows:—

	Chairman.	*Vice-Chairman.*
1. Education	Mr. G. Sharples	Mr. E. L. Oliver.
2. Finance	Mr. Peaker	Mr. F. C. Blackburn.
3. Law	Mr. Coward	Mr. Hurden.
4. Organisation	Mr. Rankilor	Mr. Caudle.
5. Parliamentary	Mr. Waddington	Mr. Cullum.
6. Tenure	Mr. T. H. Jones	Mr. T. P. Sykes.
7. Examinations Board	Mr. T. F. Bowers, B.A.	Miss Cleghorn.

Mr. Coward's work and position in the Union have more than merited his chairmanship, whilst Mr. Rankilor presides at the Organisation Committee *vice* Mr. Pickles. The health of the last-named gentleman is, unfortunately, not sufficiently robust to enable him to continue the work he has so well begun. But each of his colleagues sincerely trusts that the year's freedom from responsibility will restore him to perfect health. I hope before long to see every man who has been through the chair of the Union stand down, so far as chairmanship and vice-chairmanship of Standing Committees are concerned. There are plenty of capable younger men, whose future is before them, and who can with the utmost confidence be placed in charge of the committees. I am convinced that the work will not suffer in any way from the adoption of such a course.

The New "Art. 101 (m)." That particularly "twencent" Unionist, Mr. T. P. Sykes, evinced his usual up-to-dateness in introducing the following important motion at the May Executive meeting:—

> "That this Executive views with concern the closing of large numbers, amounting possibly to 50 per cent., of cookery, laundry, and manual instruction centres, which must follow if Art. 101 (*m*) of the new Education Code of 1901 be retained, which provides that no child under twelve years of age shall receive instruction in one of these centres."

The discussion which ensued proved for the *n*th time the truth of the old Latin adage, *Quot homines, tot sententiæ*, and the inevitable result was the reference of the question to the Education Committee, where it can be fully discussed in all its bearings. The National Association of Manual Training Teachers is naturally up in arms against the new age limitation, and in a comprehensive resolution declares its conviction that, "if the regulation be retained in the Code, it will prove most detrimental to future success, inasmuch as the majority of boys leave school at the age of thirteen or thereabouts, and it will cause a serious curtailment of the instruction which forms a basis of that higher technical work so much advocated at present as a means of retaining our commercial supremacy. As practical teachers, we are fully convinced that, instead of the limitation of the payment, an increased

rate should have been made to admit of some form of hand and eye training commencing earlier than under the present system."

So alarmed is the Liverpool School Board at the prospect that *The Liverpool Daily Post* of May 4 records its decision to absolutely dismiss forty-seven teachers, sixteen of whom are manual instructors. There really is no understanding the educational policy—if such exist—of the present Government. The self-same Code which withdraws the grants previously paid for teaching manual instruction to boys and cookery to girls, under twelve years of age, insists (in the fearful and wonderful Higher Elementary Minute) that children, aged from ten to twelve, in higher elementary schools, must spend at least four hours per week in the study of science, *half of which must be spent in the laboratory!* This glorious inconsistency should be worth something to W. S. Gilbert and librettists of his stamp.

NOTES FROM THE NORTH.

Continuation School Code. As anticipated in last month's notes, great changes have been made in the Evening School Code. The very name Evening School has disappeared, for it is pointed out in the introductory note that the classes may be held at any time of the day, morning or evening. The Code, therefore, is for Continuation Schools providing further instruction for those who have left school.

Accompanying it is issued a memorandum, which points out that the Code embraces the operations which were covered by the former Evening Continuation School Code and those which fell within the scope of the Science and Art Directory, in so far as that related to evening classes. Its essential object is to provide such special instruction as pupils who have ceased regular attendance at school are impelled to seek by experience of the requirements of life and their own particular occupation. To supply this want (the adequate fulfilment of which is of paramount interest to the community as a whole, no less than to individual scholars), it is essential that the subjects chosen by each pupil should be homogeneous in character, and should have a definite aim relative to the pupil's object in life, and that the instruction should be given only by those who possess special knowledge, both theoretical and practical, of the subjects which they undertake.

There is no restriction of age, but pupils on whom grants are paid must be free from obligation to attend school in terms of the Education Acts.

The Code is divided into four main divisions. Division I. occupies itself with the preparatory classes for the completion of general elementary education. Divisions II. and III. deal with *specialised* instruction (elementary and advanced respectively), while there is added a fourth, which includes auxiliary classes—such as physical exercises, military drill, music, and any other subject recognised by the Department. Division I., on the one hand, is intended to make provision for enabling pupils whose general education may have ceased at too early a stage, or may have lost its effect through lapse of time, to prepare themselves for the work of the special classes. On the other hand, Division IV., which may be taken concurrently with other subjects, is expected to enlarge and raise the physical, moral, and mental equipment of those who come within its influence.

It is evidently the desire of the Department, by the introduction of Division III., to encourage employers of labour to send their apprentices to schools having this division not only in the evening, but even in some cases throughout the day. The Code has many good points in it, and teachers will do well to give it a hearty welcome.

The chapter on the qualifications of teachers, and the keeping of a register of such, seems to indicate a desire for specialisation on the part of the Government.

[*A tabular summary of the provisions of this Code, entitled* **The New Continuation School Code at a Glance**, *has been prepared as a supplement to* **Nelson's Annotated Scotch Code**, *and may be obtained by forwarding a stamped addressed envelope to the publishers by any purchaser of the 1901 edition of that Code, or by any reader of this magazine—coupon to be enclosed by others than subscribers.*]

The Class Teachers' Congress. The Third Biennial Congress of the Scottish Class Teachers was held in Aberdeen. When Mr. G. Fenton, B.A., president, took the chair, there was a large gathering of delegates. The Senate of the Aberdeen University, through Principal Lang, who made a very interesting speech, welcomed Congress, while the Aberdeen School Board, through their chairman, Rev. Professor Robertson, also gave it a hearty welcome.

The president, in an able speech, referred to the great commercial conflict in which our nation had become involved. He desired to see a properly-organised system of technical, commercial, and scientific training. There was great necessity at the present time, he thought, for entrusting the guardianship of the educational chain to one supreme authority, responsible to the people, and elected *ad hoc*. There was also needed a better correlation of the work of the primary and secondary schools. The great want in the educational world to-day was men of zeal, capacity, and moral steadfastness; and he urged upon the Class Teachers' Association to press for such conditions as would best meet the necessities of the time.

As representing the National Federation of Assistant Teachers, Mr. Goldstone, Sheffield, extended congratulations; while the duty of conveying the best wishes of the N.U.T. was entrusted to Mr. Boulter. Both discharged their duties to the entire satisfaction of the audience. On the motion of Mr. R. G. Dickson, Edinburgh, Congress agreed to send a congratulatory message to Mr. Allen Croft on his election as Vice-President of the National Union of Teachers.

The "Position and Prospects of Women Class Teachers" was entrusted to Miss M'Michael, Glasgow, who gave an eminently practical paper. She pointed out that in the elementary schools of Scotland, with their ten thousand teachers, fully one half were women, of whom, again, four thousand were assistant mistresses. Promotion for them was far too limited; she therefore thought that some provision should be made for them, without detriment to other members of the profession and to other positions which were already too few. The average salary paid to women class teachers in Scotland was too little, considering that many of them had university degrees.

Mr. John Keir, member of Aberdeen School Board, and a leader of the labour movement there, moved—"That, in the interests of education, the Congress respectfully urges upon the legislature the necessity for prohibiting the employment in the morning of children attending elementary schools, and directs attention to the prevalent contravention of Section 6 of the Education (Scotland) Act, 1878." In a forcible speech he showed, from recent statistics, that the evil was a clamant one. Some people might regard it as "grandmotherly" legislation, but it was necessary for the protection of the children, who, he contended, were being brought into the labour market to compete with the older portion. This he characterised as a most iniquitous and dangerous thing. Mr. Small, Glasgow, secretary of S.C.T.A., seconded the motion, which was unanimously agreed to.

Mr. C. M'Donald, Leith, presented the "Class Teachers' Programme;" but as the speech was largely that which we referred to in our notes on the Dundee Congress, it is not necessary to recapitulate his points.

Mr. S. M. Murray, Edinburgh, expressed his sympathy with the sentiments voiced by the reader of the paper with regard to the departmental system.

Mr. R. G. Dickson, Edinburgh, moved—"That in order to secure the best educational advantages from changes recently introduced, it is essential that heads of departments be appointed in all large schools." He contended in support of the motion that, notwithstanding the far-reaching and progressive changes introduced by the Department, no serious attempt had been made to alter the management of the schools. To secure the object aimed at, there must be a quadruple alliance—the Scotch Education Department, as representing wider public opinion; School Boards, as representing local public opinion; and head teachers and class teachers, as representing the views of the profession—and these should work hand in hand towards the solution. Mr. Robb, Paisley, seconded.

The Congress expressed its heartiest thanks to the president for his conduct in the chair. The meetings were most suc-

cessful, and the Aberdeen Committee have reason to congratulate themselves on their very complete and adequate arrangements. The social part of the Congress was decidedly successful. The reception by the Town Council and the luncheon were both very well attended, and the speeches at both—not too numerous and long-winded—were very much appreciated.

Vice-Presidentship of the Institute. The voting-papers in connection with this election have now been counted, and the result shows that Mr. S. M. Murray, Sciennes School, Edinburgh, received 1,688 votes, while Mr. James Beattie, Oban High School, got 727, and Mr. J. Ingram, Wishaw, received 650. Mr. Murray has, therefore, obtained 311 more votes than the united poll of the other two candidates. We have every confidence, from a knowledge of the great work Mr. Murray has already done on behalf of the Institute, that his year of office will be signalised by most effective and efficient work for the good of the profession. We regret that the election to the vice-presidentship does not carry with it the presidentship next year. Mr. Rae, Wamphray, of whom we gave a brief sketch last month, will be president for the next year, there having been no contest for the premier office.

WITH OUR CHILDREN.

BY J. GUNN, M.A., D.SC.

A Forward Movement.

THIS forward movement has not yet taken place, but it seems as if the time for its inception were drawing near. Child-Study is at present being carried on by three separate organisations in this country—the Childhood Society, the Parents' National Educational Union, and the British Child-Study Association—in addition to, let us hope, all the various institutions devoted to the training of teachers. Yet there are many who, if they think of the subject at all, regard it as a mere "fad," or perhaps as a revolutionary and un-English pursuit. There seems some need for the workers in this branch of science to define their position, and to secure fuller recognition of the importance of their work. There seems room, too, for some form of union or correlation among the various associations of workers; at any rate, it seems undesirable for them to ignore each other any longer.

One possible way of initiating a forward movement seems to be the representation of Child-Study at the annual meeting of the British Association—the great parliament of scientists, where every branch of science is represented, and gives in its report of progress for the year. Why should not Child-Study take its seat in the House when it meets in Glasgow in the autumn?

The section or sub-section in which Child-Study appeared would be a very popular one, for there are few subjects which appeal to a wider public. As to the level of the papers which might be read, a sufficient guarantee exists in the names which stand as officials and members on the rolls of the three associations named. The gain to other and closely-related subjects would be considerable; for Child-Study has contributions to offer to psychology, to anthropology and social science, and to education, not to travel further afield. It is, indeed, mainly through Child-Study that education can hope to become scientific, and to attain to more exactness of principle than mere theory and opinion can yield. In the meantime, medicine is the only science which seems to recognise that the study of the child is as necessary as the study of the adult; and in consequence of this recognition, our knowledge of children on the physical side is in a state of satisfactory progress.

We would commend this idea of a forward movement by means of representation at the British Association to the leaders of Child-Study in and beyond the three societies named. The cause would gain much from securing a public and definite recognition, and many conventional thinkers would join in the work if they were thus assured of its sanity and respectability. In this good old country respectability can never be assured merely by character; position is essential.

"Paidologists" in Conference.

The capital of the Midlands has earned the warmest thanks of the British Child-Study Association. As an educational centre it has a good record, and it seems bent at present on earning one still better. To found a university is a big task, worthy of an enlightened community, and its accomplishment commands the praise of a wide circle. To encourage by generous hospitality, and by the personal sympathy of those in high office, a somewhat obscure association engaged in furthering a line of study which is not yet widely popular even among professional educationists, is in some aspects a still more convincing proof of the respect in which every educational effort is held in this great industrial capital.

On the evening of Thursday, 9th May, visiting and resident members of the B.C.S.A. enjoyed the hospitality of the Lord Mayor, and met a congenial company representative of every grade of education. The Association is indeed fortunate in having, in what is only its fourth annual conference, received the honour of municipal recognition and welcome; and the event is indicative not only of that interest in education, already referred to, which marks the city of Birmingham, but also of the influence commanded by the active members of the Birmingham Branch Association. On the following day the interest of the Lord Mayor was testified by his courtesy in granting the magnificent Council Chamber for the annual general meeting of the Association; while the School Board was also to the front in granting its committee room for the meeting of council in the forenoon, and for the no less important afternoon tea which followed the general meeting. In the evening it was the turn of the University to act as host, when the presidential address was delivered by Principal Lloyd Morgan, Bristol, in the large lecture room or theatre of the Medical School, the chair being occupied by Professor Sonnenschein.

Principal Lloyd Morgan was most unfortunate in one respect. Just across the way the Colonial Secretary was delivering a political address, which attracted not only a packed audience within the Town Hall, but large crowds in the adjoining streets. Even education must yield the palm to politics at such a time and in such a place, and the audience in the University theatre suffered much less inconvenience from overcrowding than that in the Town Hall. Who shall say which of the two addresses will seem the more important twenty years hence?

The address which concerns us here was an admirable review of the problems which confront the child student, given under the form of a day-dream of the lecturer regarding the book on Child-Study which he desires to see written. It would be hard to decide whether the scientific knowledge or the poetical imagination of the lecturer commanded the greater admiration of his hearers. The general result was an undoubtedly universal wish that the principal should forthwith set about writing the book of which he dreams. As a psychologist, he must be aware that all ideation tends to realise itself in action. Would that he might give us a further exemplification of this law by actualising the book of his dreams!

Saturday was devoted to Stratford-on-Avon, no doubt in order that child students might survey the scenery of the childhood of Shakespeare for themselves, and determine how this locality came to produce the matchless mind of the poet, and how it has failed to go on producing poets as a local industry. Whether this or something else formed the motive of the excursions, these were highly valued by the members of the conference, and formed the climax of the excellent programme arranged by the local branch and its enthusiastic and capable secretary, Miss Dawes.

Even so brief a notice of this conference would be incomplete without the mention of one other form of Birmingham hospitality, as we may regard it, and this was the space afforded to the proceedings by the local press. The notices were not only full, but sympathetic and unusually well-informed—an earnest of the coming recognition of Child-Study as an integral and essential line of training for all educators, whether in the home or in the school.

A Book to Read.

Mrs. Gilman's new book, *Concerning Children* (G. P. Putnam's Sons, London; and Small, Maynard, and Co., Boston), is fairly deserving of being so described. It is a book which should be most carefully read by all those who are trying to live with their children, or with other people's children, in the true sense of the phrase. In the first place, it is a charming book to read for its brightness and clearness of style. It does not matter whether you agree with Mrs. Gilman's ideas or reprobate them with the horror of outraged prejudice; you enjoy her exposition all the same. She is delightfully heretical, and throws herself with the utmost zest into her task; and that task is a charming one, too. We have heard of the revolt of woman, and we have almost forgotten that we men are now a vanquished race. But this time it is a revolt which we tremble to contemplate—a revolt of the children. The matter is serious when we consider that the children are in a majority in most well-regulated families.

Certainly Mrs. Gilman makes out a good case for reform, if not revolution, in our treatment of children. Democracy has not yet been realised in the home. Take the question of size in our ordinary home surroundings: how are the little ones treated? We build our house, and plan our rooms and staircases and windows, without the least regard to the stature of the majority of the inmates. Of course it might be answered that we cannot plan things to suit a stature which is increasing day by day, until some one invents a house which will grow up along with the children; but there is much ground for the writer's complaints.

A still better case is made out for greater courtesy towards children. We snub and bully them a good deal, no doubt. We refuse to take them seriously, and we are callous to many of their tenderest feelings. We confess they don't get fair play. We are reminded here of the grievances of an early companion of our own, who complained bitterly (in private) that when any serious difference of opinion arose between him and his father, the latter always took an unfair advantage of his superior strength. This is perhaps an extreme case, but it is typical of much. We are entirely at one with the writer in her arguments for the respect due to youth, even if our own boys should feel doubtful as to how far our daily practice conforms with this confession of faith; but we feel that in her attacks on the traditional respect enjoined towards age, she has underestimated the strength of the case against her.

In one of her early chapters the writer discusses at some length the question of obedience, and she comes to the general conclusion that it is *not* a virtue. Indeed, we gather that the habit of prompt obedience is a very dangerous thing, and that American children suffer much from this particular abuse. No doubt Mrs. Gilman speaks from adequate knowledge, but this view is novel to one whose acquaintance with American children is chiefly at second hand. It is not long since we heard the view advanced and defended by a friend in a busy Western state that the children "out west" governed the country; for while the men seemed to govern, the women ruled the men, and the children ruled the women. Whatever may be the exact amount of harm done by obedience in America—and we still cherish a hope that our writer exaggerates the seriousness of the case—this chapter is one which is worthy of the most careful study, especially by parents.

One of the most suggestive and least conclusive chapters is that on ethics. Starting with the assumption that "ethics is as plain a science as physics, and as easy of application," it is natural that the writer should feel it difficult to explain how our advance in moral conduct lags behind our advance in applied science. If one begins by assuming that knowledge of ethical principles and advance in moral conduct are connected as closely as are knowledge of scientific principles and advance in industrial arts, one may expect to find some difficulty in explaining the state of society; and so the reader finds no cause for surprise in the fact that the writer's explanations are quite as inexplicable as the facts they are supposed to explain.

We commend to mothers and to teachers of young children the practical reforms advocated in the way of the training of nursemaids, and the establishment of what we may call co-operative nurseries. There is much sound common sense in these chapters, if a mere man may venture to express an opinion on such subjects.

To every one who is interested in youth we would commend the study of Mrs. Gilman's remarks on the vast importance of the "precious ten" years which lie between fifteen and twenty-five—the years whose proper use alone renders it possible that the family of one generation shall be better than that of the last. One wants to review the "Cockerton judgment," and many other things besides, in the light of the great importance for good or for evil of those years of adolescence. It is a sad misfortune that most of our children *must* leave school at fifteen or earlier; but if we practically force all our children to do so, we are not only committing a national crime—we are committing a national blunder. We do not yet recognise the futility of insisting on school teaching for young children, while withdrawing all systematic aid and guidance at the age when these begin to be most valuable and formative. We leave the best period to the haps of fortune, trusting that we shall "muddle through" somehow. And if there chance to be here and there among us those who dream of a better way, we take measures to protect the ratepayers against such vain dreamers.

On the whole, we feel amply justified in describing *Concerning Children* as a book to be read, and to be carefully read. It is full of pregnant suggestions, and of trenchant criticism of things that ought not to be. The revolt of the children is happy in its leader.

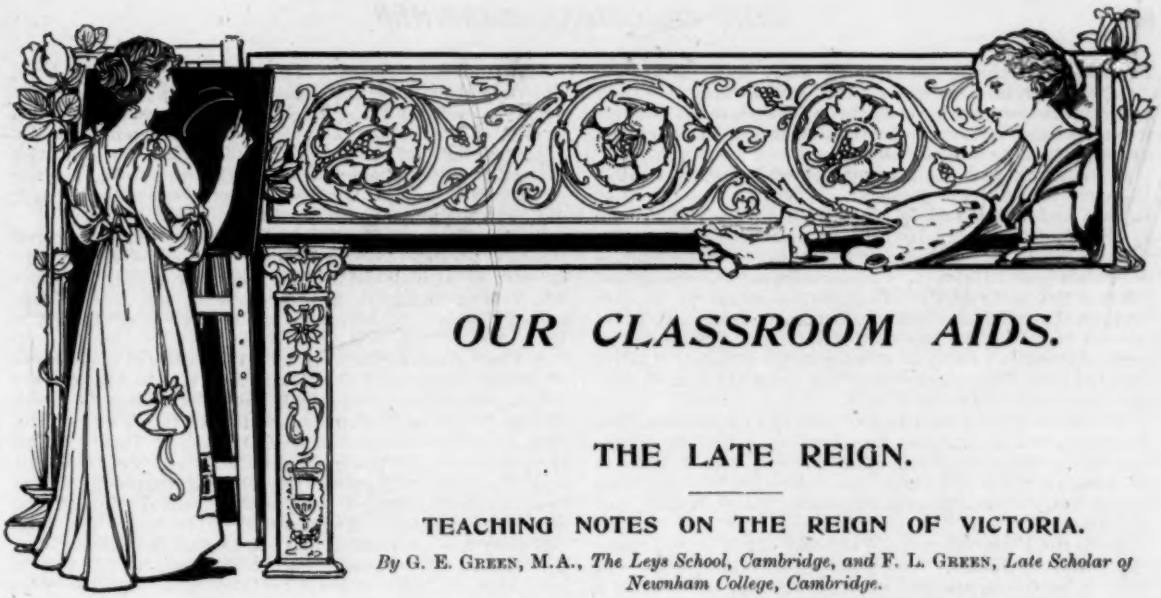
Another Good Book.

The literature of childhood is manifesting a vigorous and healthy vitality at present. We have now before us a noteworthy little volume about little folks, entitled *The Child: His Nature and Nurture*, by W. B. Drummond, M.B., C.M., M.R.C.P.E., Physician to the Western Dispensary, Edinburgh, and published by J. M. Dent as one of the series of Encyclopædic Primers. Dr. Drummond, it may be noted, is an active member of the Edinburgh Branch of the British Child-Study Association, and we may be allowed to suggest that it is partly at least due to his experience in the work of that association that he has been able to produce so comprehensive and useful a manual. Thorough medical training and experience are, no doubt, the basis of his qualifications to write regarding the child, but the primer is one which no physician could have produced without a wider knowledge than that gained from the classroom and the hospital ward.

In the chapters dealing with the physical nature and treatment of the child we have the opinions of a shrewd, practical medical man who is no faddist, and does not insist on any narrow views; he is catholic and full of common sense, and, accordingly, he will be useful to every reader. But when Dr. Drummond wanders beyond his own professional domain, he is equally at home with his subject, and gives evidence of careful study of the child in all his relations. His treatment of the emotional and intellectual nature of the child, of the will, and of the function and growth of habit, is sound and suggestive. Even the kindergarten finds in him a clear and sympathetic exponent.

His short chapter on "Child-Study: its History, its Methods, and its Results," is so good that we can only regret its brevity. But when a writer has to give an encyclopædic account of such a varied subject as the nature and nurture of the child within the limits of 150 small pages, something must suffer by condensation. It would be more correct to say that everything must suffer, for even within these narrow limits Dr. Drummond has managed to find at least some space for every aspect of his subject; and this is equivalent to saying that everything has been compressed to the extreme point of possible compression. Yet there is no obscurity anywhere.

It is a well-known principle that no man can write well a *small* book on any subject unless he has written, or is qualified to write, a *big* book on the same subject. Judging by this standard, Dr. Drummond either has written, or ought to write, a big book on the nature and nurture of the child. We have not yet seen this volume, but we shall be very much interested in its appearance, and we have no doubt that this interest would extend to a wide circle.



OUR CLASSROOM AIDS.

THE LATE REIGN.

TEACHING NOTES ON THE REIGN OF VICTORIA.

By G. E. GREEN, M.A., *The Leys School, Cambridge, and* F. L. GREEN, *Late Scholar of Newnham College, Cambridge.*

IV.—FOREIGN RELATIONS.

I. ENGLAND AND ITALY.

1. The Revolutions of 1848.—In 1837 the peninsula of Italy included the kingdom of Sardinia (Savoy, Genoa, and the island of Sardinia), the kingdom of Naples and Italy, the Papal States, Venetia, and the duchies of Lombardy, Tuscany, Modena, Romagna, etc., which were under Austrian control. The government in these duchies and in Naples was despotic. In 1848 the Italians determined to expel the Austrians and establish Italian unity. England had sheltered Mazzini, and was in sympathy with the movement. At Novara, in March 1849, the King of Sardinia was defeated by the Austrian general Radetzky. The subjects of Pius the Ninth revolted, and established themselves as a republic. Louis Napoleon sent a force of 45,000 French soldiers to restore his temporal sovereignty. Garibaldi was forced to surrender Rome, and the Pope returned to the Vatican.

2. Cavour and Italian Independence.—In 1850 Count Cavour entered the Sardinian Cabinet with the watchwords, "Liberty, constitutional government, and freedom of trade." When England and France declared war against Russia in 1854, Cavour joined the Allies, and sent a force of 25,000 men into the field. He concluded a treaty with France, by which France was to drive the Austrians out of Italy, and to procure the union of Lombardy and Venetia with Sardinia by the cession of Savoy and Nice. By the Treaty of Villafranca, 1859, Austria gave up Lombardy, but retained Venetia, while the duchies of Tuscany, Parma, and Modena, and a portion of the subjects of the Pope, joined themselves to Sardinia.

Naples was regarded with much disfavour by England and the other Great Powers. Its king, Ferdinand the Second, a Bourbon, was a tyrant, and Gladstone, when visiting Naples, had ascertained that it contained 20,000 political prisoners. In 1860 Naples and Sicily rose under Garibaldi with the cry, "Italy and Victor Emmanuel." Naples joined Sardinia, and Ferdinand the Second fled from the kingdom.

3. United Italy.—When Prussia declared war against Austria, in return for 80,000 men and the whole Sardinian naval force Prussia bound herself not to make peace with Austria till Venetia should be gained for Italy. The Italian arms were unsuccessful, and Venetia was ceded to France by Austria. Napoleon gave Venetia to Sardinia, while upholding the temporal power of the Pope. When the Prussians entered Paris in 1870, the troops of Italy forced an entrance into Rome, which became the capital of United Italy. Italy in 1862 had a debt of one hundred and thirty-five millions sterling. It is now four hundred millions, and still increases.

II. ENGLAND AND FRANCE.

1. Louis Philippe, 1830–1848.—He clung tenaciously to the English alliance. When his fourth son, the Duc de Montpensier, was betrothed to the sister of the Queen of Spain, England forced on the French king a pledge that the marriage should not take place till the Spanish queen was married and had children; but three years later, in 1846, the king broke his pledge, and pressed on Spain an arrangement by which the two marriages were celebrated together. This led to great coolness between England and France. But when Louis Philippe lost his kingdom in the Revolution of 1848, he was received as an exile by England, and died at Clermont, 1850.

2. Louis Napoleon.—The nephew of Napoleon the First, who had also been an exile in England, became President of the Second Republic, and established the Second Empire, December 1851. After his surrender at Sedan to the Prussians in 1870, Louis Napoleon was deposed at Paris. He settled in England, near Chislehurst, and died there in 1873. His only son, the Prince Imperial, died fighting under the British flag in Zululand in 1878.

3. Presidents of the Third French Republic have been M. Thiers, 1871; Marshal MacMahon, 1873; M. Grévy, 1879; M. Carnot, 1887; M. Périer, 1894; M. Faure, 1895; M. Loubet, 1899.

4. Commercial Relationships.—(1.) Convention between France and England for the suppression of the slave trade was made in 1845.

(2.) Cobden's Treaty of Commerce between France and England was signed in 1860. The French withdrew from it in 1872, and a new treaty, not based on Free Trade principles, was then signed.

(3.) Agreement between England and France recognised the French protectorate of Madagascar, 1890.

(4.) Agreement between France and England to refer the Newfoundland fisheries dispute to arbitration was opposed by the colony.

(5.) Anglo-French dispute as to the boundaries of Siam arranged.

(6.) In March 1890 an agreement was made with France as to spheres of influence in Central Africa.

III. ENGLAND AND GERMANY.

1. Friedrich Wilhelm the Fourth and Federal Unity.—By the Treaty of Vienna, in 1815, the States of Germany were formed into a weak league, the Germanic Confederation, which lay at the mercy of Austria, and Prussia, the ally of England against Napoleon the First. Prussia and Austria struggled for supremacy in the Confederation. In 1848 the Kings of Saxony and Würtemberg granted constitutions to their people. Frederick William the Fourth of

Prussia proposed the union of Germany into one federal state, of which he was determined to be the head. He tried a democratic form of government, which provoked destructive riots; then he came under the influence of Bismarck, the uncompromising enemy of Liberalism.

2. Bismarck and the Ascendency of Prussia.—In 1861 Bismarck became the minister of William the First of Prussia, and determined to effect the supremacy of Prussia in the Confederation. In 1864 he succeeded in inducing Austria to join him in wresting from Denmark the duchies of Schleswig and Holstein. Prussia acquired the former and Austria the latter duchy. This settlement led to disputes between Austria and Prussia. Bismarck resolved to expel Austria from the German Confederation, and to unite the remaining states in a close alliance under Prussia. Austria declared herself the "upholder of the whole German Fatherland," and war was declared, 1866.

At Sadowa Prince Frederick Charles of Prussia routed the Austrians, and Austria was forced to consent to the formation of the North German Confederation, with Prussia at its head, and a South German Confederation, presided over by Austria. Prussia absorbed Hanover, Hesse, Nassau, and Frankfort.

When the Franco-German War broke out in 1870, Prussia was joined by Baden, Hesse-Darmstadt, Würtemberg, and Bavaria (southern states), which broke up the Southern Confederation.

3. The New German Empire.—At the beginning of 1871 the new German Empire was established, with Prussia at its head. Germany now consists of twenty-six states; four kingdoms—Prussia, Bavaria, Saxony, Würtemberg; six grand duchies—Baden, Hesse, Mecklenburg-Schwerin, Saxe-Weimar, Mecklenburg-Strelitz, Oldenburg; five duchies—Brunswick, Saxe-Meiningen, Saxe-Altenburg, Saxe-Coburg-Gotha, Anhalt; seven principalities—Schwarzburg-Rudolstadt, Schwarzburg-Sondershausen, Waldeck, Reuss (elder line), Reuss (younger line), Schaumburg-Lippe, and Lippe; three Hanse towns or free cities—Lübeck, Bremen, Hamburg; one imperial province—Alsace-Lorraine.

4. Miscellaneous.—(1.) In 1872 the German Emperor, as arbitrator, decided the San Juan boundary dispute against England.

(2.) In 1890 an agreement was arrived at between Germany and England as to the delimitation of their spheres of influence in Africa. Nyassaland was recognised as British, and Germany withdrew from Witu and Somaliland. The British protectorate of Zanzibar was recognised, and Heligoland was surrendered to Germany.

(3.) In 1899 an agreement was made with Germany as to Samoa.

Very friendly relations now exist between Germany and England, partly in consequence of the relationship of its last two sovereigns—Kaiser Friedrich Wilhelm the Fifth, son-in-law of Queen Victoria, and Kaiser Wilhelm the Second, nephew of King Edward the Seventh.

IV. ENGLAND AND AUSTRIA.

1. The Struggle of Hungary for Independence.—This struggle against Austria met with much sympathy in England. Kossuth, who subsequently became an exile in England, headed the insurrection of 1848, became head of a provisional government formed at Pesth in 1848, and was declared Governor of Hungary as a free state in April 1849. Austria then appealed to Russia for help, and Kossuth resigned. General Georgey, who became Dictator, surrendered unconditionally, and Hungary was thoroughly reduced.

2. The Emperor Francis Joseph and Constitutionalism.—Suddenly the Emperor Francis Joseph entered on the path of constitutionalism. In 1867 Hungary obtained her own legislature, chosen by the almost universal suffrage of her people, and the Emperor and Empress were crowned, at Pesth, King and Queen of Hungary. The Empress Elizabeth of Austria was a frequent visitor in England. Our relations with Austria since the Hungarian Revolution have been friendly.

V. ENGLAND AND TURKEY.

1. Turkish Misgovernment and Russian Ascendency.—The Turkish government is a system of organised robbery. The despotism of the Sultan is absolute, only controlled by public opinion and the likelihood of assassination. The peoples of the Turkish Empire are subject to what is really a hostile military occupation. Russia has for centuries coveted Constantinople and the Turkish seaboard, but the jealousy of the other European Powers, especially England, has up to the present prevented this aggrandisement.

2. Rebellion of Mehemet Ali, 1840.—England feared Russia's advance towards India. When the Sultan was threatened with defeat by his rebellious vassal, Mehemet Ali, Viceroy of Egypt, England, Prussia, and Austria supported Turkey. Mehemet Ali was reduced to submission in 1841.

3. The Crimean War.—In 1852, the Sultan, at the instance of France, supported the Latin monks, who claimed the keeping of the Holy Places in Palestine, as against the Greek monks. The Czar Nicholas supported the Greek monks, and claimed a protectorate over the Christians of Turkey. This the Sultan refused to admit, and Russia occupied Moldavia and Wallachia. Canning, the English representative at Constantinople, desired war, and promised Turkey the alliance of England. War was declared in 1854. The English army was commanded by Lord Raglan, the French army by Marshal St. Arnaud. The chief events of the war in 1854 were the battle of the Alma (September), the besieging of Sebastopol (October), the battle of Balaklava, famous for the charges of the Heavy Brigade and the Light Brigade (October), and the battle of Inkermann. During the winter the troops suffered severely from illness, exposure, and want of food and clothing. At one time the army consisted of 11,000 men under arms and 13,000 in hospital. Lord Aberdeen was replaced by Lord Palmerston, who hurried supplies and reinforcements to the front. A railway was built from Balaklava to the front, and Britain had soon 40,000 men in the field. In 1855 the Czar Nicholas died, and was succeeded by the Czar Alexander the Second. In 1855 the French captured the Malakoff, and the English carried the Redan. The Russians then abandoned Sebastopol, and the war was practically at an end. The Treaty of Paris, 1856, provided—(1.) That the Black Sea should be neutral—open to the commerce of all the world and closed to warships. This provision was cancelled by the Congress of London in 1871. (2.) That neither Russia nor Turkey should build any fortress on the shores of the Black Sea. (3.) The waters of the Danube were thrown open to European trade. (4.) The Great Powers agreed that they had no right to interfere on behalf of the Sultan's Christian subjects.

4. The Russo-Turkish War of 1877.—In 1874 Herzegovina revolted against Turkey, and the Russian and French Consuls were murdered. Great Britain dispatched a fleet to Besika Bay, and issued a proclamation that she would allow no change in Turkey without her consent being obtained to it. Then came war, in which Turkey was defeated. By the Treaty of San Stefano, (1) Montenegro and Roumania became independent of Turkey, and were given an increase of territory; (2) Bulgaria was granted a certain measure of autonomy; (3) provision was made for the government of Bosnia, Herzegovina, and Crete; (4) better treatment was guaranteed for the Armenian Christians; (5) part of Bessarabia, Batum, Kars, Ardahan, and a war indemnity were granted to Russia. England secured Cyprus, and Austria got Bosnia. The Berlin Congress then met to decide how far the treaty should be carried out. Lord Beaconsfield and Lord Salisbury represented England. The Treaty of Berlin, 1878, decided—(1) that Bulgaria should be confined to the country north of the Balkans; (2) that the part south of the Balkans should be called Eastern Roumelia, and be nominally subject to the authority of the Sultan. Notwithstanding treaties, in 1896 thousands of Armenians were massacred in the streets of Constantinople.

5. Crete.—In 1897 the Powers combined in the European Concert, and tried in vain to make the Sultan carry out his promises of reform in Crete. The Greeks, who declared that the Christians of the island desired union with them, sent naval and military forces to Crete. War ensued, in which the Sultan was victorious.

(To be continued.)

WIRELESS TELEGRAPHY.

NOTES OF A SCIENCE LESSON.

BY C. A. WEST, B.SC., A.R.C.S.

DURING the last decade great progress has been made in all directions in electrical science. New facts have been discovered, new relationships have been found to exist between apparently unrelated phenomena; theories have been modified and extended, and new applications of well-ascertained scientific truths have been made.

Amongst the latter, one of the most interesting, and one which is destined, at no very distant date, to play an important part in connection with our well-being as a nation, is what is popularly known as wireless telegraphy. Many are the attempts which have been made to send telegraphic messages without connecting wires, and several different principles have been employed by different experimenters. The system which seems to give the best results, and to be most capable of extension, is that of Signor G. Marconi. In the following notes an attempt is made to represent the main principles of Marconi's system in such a form as to serve as notes of a lesson or lessons to children who have already been through a course in magnetism and electricity.

The Ether.

When the sun is shining brightly, we receive from it a large amount of light and heat. We can convert the heat into work—that is, we can, if we choose, use the sun as a source of energy. By measuring the heating effect of the sun's radiation, we can calculate the amount of energy transmitted to us in a given time. How does this energy travel through space from the sun to us, and in what form does it exist whilst on the journey? We can only conceive of two possible modes of transmitting energy from the sun to the earth, and both of these require the existence of some substance by which it may be transmitted.

In the first, we may suppose that particles of matter are thrown off by the sun, and that these travel to the earth, each carrying a definite amount of energy, just as energy is carried by flying bullets.

In the second, we may suppose that there is a medium occupying the space, and that a disturbance is propagated through this substance, and that the energy is transmitted somewhat in the same way as energy is transmitted by waves on the surface of water. In this way the energy is passed on from one portion of the medium to another, until it reaches the earth.

The theory that light and heat are material substances, hurled from the sun in all directions, is incapable of explaining many of the well-ascertained facts in connection with light and heat; and, moreover, Count Rumford and Sir Humphrey Davy have definitely proved, by direct experiment, that heat may be generated by doing work, as in the case of the work done in overcoming friction between two bodies, and the amount of heat obtainable in this way is unlimited. Hence heat is not a material substance, for we cannot create matter. The view is therefore held by scientists that the energy is transmitted from the sun to the earth by means of a wave motion of some kind, in some medium which pervades all space and all matter.

This hypothetical substance is called ether; and although there is no absolute proof of its existence, still we cannot imagine how energy can be sent to us from the stars without some medium by means of which the energy vibrations may be transmitted.

Assuming, then, the existence of this all-pervading ether, we are able to explain and classify a large number of known facts in connection with light and heat; and new experiments and discoveries tend, without exception, to confirm the belief that light consists of vibrations of the ether. The phenomena of magnetism and electricity are also probably due to the vibrations of this same substance.

In the case of the waves of light, the wave-length varies with the character of the light, but the length of the wave is in every case very short, never exceeding one-thousandth of a millimetre. (For the various methods of measuring the wave-length, see text-books on the wave theory of light.) In the case of electrical vibrations, the known wave-lengths vary from about one five-hundredth of a millimetre to about eighty thousand metres. We shall now see how these electrical vibrations may be produced.

The Discovery of Hertz.

About fourteen years ago, a German physicist, Hertz, during a lecture, was using two flat coils or spirals of wire. Whilst carrying out some experiments with these coils, he noticed that when he discharged a quantity of electricity from a small Leyden jar through one of the coils, a current was produced in the other coil, although it was not connected to the first one. He investigated the matter, and found that a current was generated in the second spiral if there was a small gap in the first coil, so that a spark jumped across a short distance.

In this Hertz had made a great discovery—a discovery which scientists had sought after for years. It had been previously shown, theoretically, that under certain conditions, when a simple condenser such as a Leyden jar is discharged, the discharge is not instantaneous, but oscillatory. The oscillatory character of the discharge may be illustrated by means of a pendulum. If we move the bob of a pendulum from its position of rest, we raise it to a certain extent—that is, we expend energy on it. On releasing it, the bob of the pendulum swings back to its position of rest. But it does not stay there; it moves on beyond it for some distance, and then comes back, but again overshoots the mark.

In this way it oscillates backwards and forwards for some time; but the oscillations, although each occupies the same length of time, gradually get less and less, until the pendulum comes to rest.

Just in the same way, when we charge a Leyden jar we expend energy on it, and place the glass in a state of strain. When we discharge the jar, the glass recoils, as it were, from the state of strain, and this causes a current to flow from one coat of tinfoil to the other. It, however, overshoots the mark, and for a short time the jar becomes charged in the opposite way; the current now flows back and charges the jar again in the same way as at first. This process of discharging and charging the jar continues with rapid and regularly-timed oscillations until the energy has been dissipated. These oscillations are communicated to the surrounding ether, in which waves are set up, just as waves would be set up in water by the regular oscillations of any body immersed in it. The ether waves thus generated spread outwards in all directions into the ocean of ether beyond.

The importance of Hertz's discovery lay in the fact that he had discovered a means of detecting these waves. He found that these waves were able to produce currents of electricity in a coil of wire, and he found that this was true even if the coil of wire were situated at some distance, or even in another room with the doors closed. He thus showed that these waves were able to pass through closed doors, brick walls, etc. On experimenting further, he found that these waves would not pass through sheets of metal, but were reflected by metallic surfaces, and that they obeyed the same laws of reflection as waves of light did. Later he was able to show that they could be refracted, and that they behaved in every way just as light waves do, and the only difference between them seemed to be a difference of wave-length. The eye is affected only by waves of very short wave-length, and by these only over a very limited range. Many bodies which are opaque to the short waves are found to be quite transparent to the longer waves, as in the case of the electrical waves of Hertz passing through the walls of a building.

Marconi's Work.

Without entering into the description of the various detectors which have been used by other experimenters since Hertz published his results, we will pass on to describe the apparatus used by Marconi for producing and detecting the electrical waves. Fig. 1 shows the exciter or sending apparatus. C is an induction or Ruhmkorff coil, the inner coil of which is connected by the wires w and w_1, and through a

key, K, with the voltaic battery B. The outer or secondary coil is connected by the wires w_2 and w_3 to two small brass

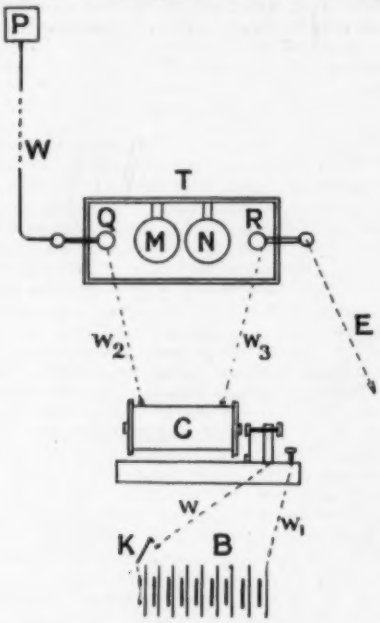


Fig. 1.

balls Q and R. Between Q and R are two larger solid brass balls, M and N, about 1 millimetre apart, and each about 11 centimetres in diameter. M and N are insulated, whilst R is connected by the wire E to the earth, and Q is connected by a thick insulated wire, W, to a sheet or cylinder of zinc, or a network structure, P, on the top of a tall mast or pole. When the primary circuit of the Ruhmkorff coil is made and broken by means of the key K, induced currents are produced in the secondary coil, and sparks pass between the brass balls Q, M, N, and R. These are similar to the oscillatory discharges from a Leyden jar. Waves are produced, and they spread out into the ether from the plate P. Marconi constructs his sending apparatus so as to send out about 250 million waves per second, each wave being about $1\frac{1}{2}$ metres long.

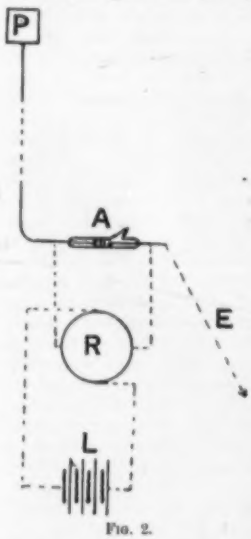


Fig. 2.

As a detector Marconi uses a special form of what is known as the Branly-Lodge detector. This is shown full size in Fig. 3. It consists of a glass tube, the internal diameter of which is $2\frac{1}{2}$ millimetres, and the length 40 millimetres. Into this two pieces of silver, x and y, of the shape shown in the figure, are tightly fitted so as to leave a space of one millimetre between them. This space is rather loosely packed with a powder composed of 4 parts of silver and 96 of nickel, worked up with a very little mercury. Wires attached to the pieces of silver are fused through the glass; the air is pumped out of the tube, so that it may not oxidise the powder, and the tube is then sealed up. The detector works in the following way. Under ordinary circumstances the powder between x and y lies with the particles loosely touching each other and pointing in all directions, and there is not a good conducting connection between x and y; but immediately the ether waves reach the powder they cause the particles to marshal themselves in lines from x to y, and to cling together, forming a fairly good metallic connection between the two pieces of silver. The motion of the particles can easily be observed through a microscope.

The detector (or coherer, as it is sometimes called) is connected up with the rest of the receiving apparatus, as shown in Fig. 2. A battery, L, is connected to an ordinary telegraphic relay, R. The circuit is completed through the

Fig. 3.

coherer A. One end of A is also connected by a thick insulated wire to a plate of zinc, P, on the top of a tall pole, and the other end is connected to the earth by the wire E. The earth connection seems to make the apparatus work more satisfactorily, and, at the same time, it forms a good protection from lightning. When the particles in A lie in disorder, no current flows; but when the waves collected by P act on them, the current is enabled to flow. A light tap given to A puts the powder again in disorder, and the current stops. This tapping is done automatically by a little electric hammer similar to that on an electric bell. In this way the current can be started and stopped, and a series of messages sent. The working at the receiving end is the same as in an ordinary telegraphic installation, with the exception that the current is started by the ether waves acting on the coherer, instead of being started by a current sent along a wire from the sending station.

The object of the tall poles used by Marconi is to enable the signals to be sent to a greater distance, Marconi having found by experiment that the distance to which the signals may be sent varies directly as the square of the height of the poles. Hills and other obstructions interfere with the messages; for, although the waves are capable of passing through most solid bodies, they are considerably weakened by doing so.

The following apparatus to illustrate the subject of wireless telegraphy may readily be set up in any school possessing a good battery of several cells, and an induction coil or a Wimshurst induction machine. The arrangement shown in Fig. 4 may be used for the sending apparatus. F and G are

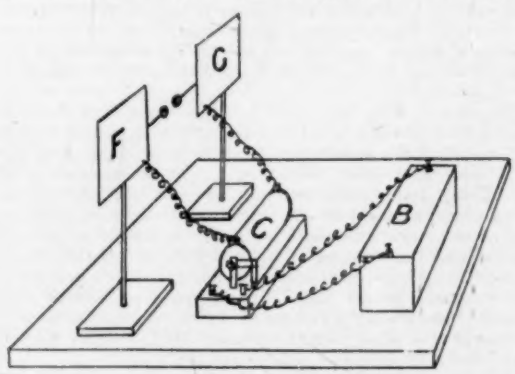


Fig. 4.

two plates of zinc about nine inches square, with the edges rounded off. They are supported on glass rods, and each carries a brass wire with a brass ball of about one inch in diameter. F is connected by a wire to one terminal of the secondary coil of the induction coil, and G to the other terminal. B is a battery of several cells, the terminals of which are connected by wires to the primary coil. When the current is switched on, sparks pass between the two balls on F and G, and the ether waves spread out from the space between the balls.

Instead of the above apparatus a Wimshurst machine may be used.

A detector or coherer may readily be made in the follow-

ing way:—Take a piece of glass tubing about 6 centimetres in length and half a centimetre internal diameter. Into each end of this fit a thick piece of iron wire by means of a cork so that the ends are about a millimetre apart, and fill the tube loosely with small iron filings. Connect this in series with a battery cell and a moderately sensitive galvanometer, as shown diagrammatically in Fig. 5.

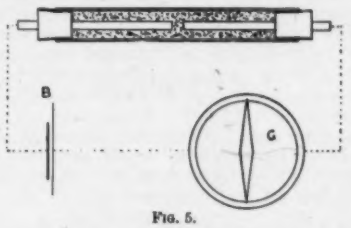


FIG. 5.

Before the waves are produced by the sending apparatus very little or no deflection will be observed in the galvanometer, showing that practically no current is flowing. When, however, the exciter is caused to act, a deflection is at once observed. On stopping the exciter the current still flows through the galvanometer, until the coherer is lightly tapped, so as to disturb the iron filings.

An electric bell may take the place of the galvanometer if a battery of several cells be used. One cell is usually not sufficient to ring a bell with the coherer in the circuit, as the resistance of the coherer is generally considerable.

Since Marconi applied for his patent on June 2, 1896, he has made much progress in perfecting his system. He has succeeded in sending messages to a distance of over two hundred miles. Although Marconi has succeeded so well, we must not jump to the conclusion that wireless telegraphy will supersede the ordinary telegraph, for at present the messages sent out by one Marconi apparatus may be received by any number of receiving stations, and hence there can be no secrecy. Of course it is possible that this may be overcome in time.

Again, the Marconi system would not be suitable for a large town where there are numerous telegraph and telephone wires, as these interfere with the messages.

It will, however, no doubt prove very useful in the open country and over the sea. Already a considerable number of British warships have been fitted with Marconi's apparatus, and the signal stations at Dover, Culver Cliff, Portland Bill, Rame Head, Gibraltar, and Malta have been equipped, or are just about to be supplied, with the necessary apparatus. As an example of the successful experiments that are being carried out, we may quote the following Reuter's message from Malta, after the *Ophir* had left that place for Australia with the Duke and Duchess of Cornwall on board: "Wireless messages have been received from the *Ophir* 110 miles out, saying that she was making sixteen knots, and that the weather was fine."

Probably one of the most important uses of wireless telegraphy will be to enable ships to communicate with people on land, especially during storms and when vessels are in distress. Wireless telegraphy is yet in its infancy, and no one can tell how great its future may be.

A New Zebra.—At a recent meeting of the Zoological Society the secretary exhibited the stripes of the skin of a zebra sent by Sir Harry Johnston from the Semliki River, near the border of the Uganda Protectorate, which seems to form an entirely new member of the group.

Primula Obconica and Skin Irritation.—Herr Nestler has lately instituted a series of experiments with the view of ascertaining which part of the plant produces the irritation. When the plant was placed in a moist room, the water which collected on the margins of the leaves had no effect, nor had the juice which he expressed from the leaves and flower-stalks. When a young umbel was applied to the wrist by an elastic band for two hours, it proved almost harmless; but a piece from the base of a leaf-stalk, applied in the same way for two hours, produced acute irritation with blisters, and his arm swelled. Herr Nestler has discovered that it is the yellowish-green matter in the glandular hairs which possesses the poisonous properties.

A COURSE OF OBJECT LESSONS FOR GIRLS' SCHOOLS.

BY WILLIAM DONE, B.A.,
Head-Master of Brighton Pupil Teachers' School.

VI. SODA AND BLUE.

Articles of Illustration.—Some fresh washing-soda and some which has been exposed to the air. A day or two previous to the lesson make a saturated solution of soda in hot water. Suspend a pebble in it by a thread, so that a deposit of crystals may be formed. In addition, the glasses and apparatus for heating as in last lesson, a little vinegar or other dilute acid, a funnel and blotting-paper, cake of blue, pieces of calico.

EXPERIMENT AND OBSERVATION.	RESULT OR INFERENCE.
Let the girls each have a piece of fresh soda. Note its appearance, its taste, and feel.	Soda is more or less transparent, has a biting, unpleasant taste, feels soapy, has a crystalline form.
Make a cold solution. When no more can dissolve, heat the water and add more soda. Take frequent observations of the temperature. It will be found that after 32° C. has been passed the water dissolves less soda instead of more.	Water can dissolve soda. Warm water dissolves more soda than cold water.
Show the previously prepared saturated solution with deposit of crystals.	Our crystals are smaller than the usual commercial ones, but their form is better seen (oblique, rhombic, octahedral).
Refer to previous lesson on the making of a piece of soap, and to the action of soda and potash on grease.	Soda unites with fat to make soap. Soda and potash are alkalies, and can dissolve grease.
Refer to soda being used in the water for washing clothes.	From previous lesson we saw that the soda helped to soften the water, as well as to dissolve grease.
We do not soften water used for washing our skin with soda.	Soda is irritating to the skin. We have noticed further the appearance of the hands after washing clothes.
Ask for the names of articles that mother does not wash in water with soda—woollen materials, laces, muslins, coloured prints.	[Teacher to tell that soda causes flannel to mat, shrink, and become hard. It rots the fibres of cotton and linen, and causes coloured things to run or fade.]
Not too great a quantity of soda is put into any water used for washing clothes.	For the same reasons as above. Soda also discolours white things, giving them a yellowish tint.
Refer to the difficulty of keeping soda properly, unless kept dry and shut away from the air.	Soda exposed to the air parts with moisture rapidly. Its crystalline form breaks down.
Show some soda which has thus been exposed to the air.	It becomes a powdery mass, because it loses the water which is necessary to make it keep its crystalline form.
Take the blue-bag. Show also a cake of blue. Make a strong solution. Filter it, dip a piece of calico into it.	By the colour going through the filter-paper, evidently we have made a solution. It is a strong solution, and dyes the calico.
Mother only tinges the water with blue, and the effect is to make the clothes whiter.	[Teacher to remind class that soda has a tendency to turn white things yellow. The blue in the solution counteracts the yellow tint, and the result is that the things remain white.]

Additional Information.—Soda was formerly made from burnt seaweed, or kelp, as it is called. The ashes were soaked in water, which dissolved the soda, and after filtration the water was evaporated, leaving the soda crystals. It is now, however, chiefly manufactured from common salt by means of sulphuric acid, charcoal, and chalk. The chemical name for soda is sodium

carbonate. It is very largely used in manufactures, especially in those of soap and glass.

Washing-blue is made from various substances, chiefly from indigo, a vegetable product.

VII. THE AIR IN ITS RELATION TO HEALTH.

Articles of Illustration.—A soup plate; large glass jar, such as a marmalade jar; a pennyworth of lime-water from a chemist's; a saucer, piece of candle, a long quill or piece of glass tubing.

Experiment and Observation.	Result or Inference.
Refer to the custom of opening the windows at school and at home, and ask the reason.	The fresh air has to be allowed freely to enter rooms in which one lives.
Question as to some of the effects of insufficient ventilation.	Headache, drowsiness, a tendency to yawning.
Recall to the children's minds the different appearance of people who live a great deal in the pure air of the country or the seaside, and those who pass their lives in large towns.	The fresh air causes people to have much better health, more vigour, and greater cheerfulness. We like to take our holidays in the country or the seaside for this reason.
Ask whether fresh air is also necessary to plants and animals.	Plants and animals also need good air.
Put a little water in the soup plate, stand a small piece of candle in it (about two inches). Light the candle, and invert the glass jar over the candle on to the plate.	The candle soon flickers and dies out.
Repeat the experiment, and, just as the candle is flickering, tilt the jar a little above the surface of the water, so as to admit a fresh supply of air.	The flame revives as soon as fresh air is admitted, so fresh air is necessary for the burning of the candle.
Tell the class that the candle, in burning, used up one of the constituents of the air—namely, the gas oxygen.	Perhaps this is what animals and plants take from the air. [Teacher to confirm.]
In last experiment replace the jar until the candle dies out; slip a piece of glass or slate over the mouth of the jar. Reverse it, pour in a few drops of lime-water, and shake up the contents.	The water in the jar and the added lime-water both turn a slightly milky colour.
Take a glass with some lime-water in it. Let a girl breathe through it down the long quill or piece of glass tubing.	The same milky appearance is observed.
Refer to previous lesson on Hard and Soft Waters. Tell them the glass of water we have just used and the water we poured into the jar were both lime-water—that is, water with a grain or two of lime dissolved in it.	The milky appearance is similar to that produced in lime-water by carbonic acid gas, which precipitate was the same substance as that we call chalk. [Teacher confirms this.]
A day previous to the lesson set a saucer of lime-water in an exposed place in the school-room. Now examine this water.	We have here a scum on the top of the lime-water. A little of this taken on the tip of the finger has a distinctly chalky look.
Sum up the results obtained thus far.	Animals, plants, and things which burn in air, take out oxygen and give back carbonic acid gas.
Let the girls breathe hard on their slates for a few seconds.	The slates become visibly wet when breathed upon.
Hold a cold slate to a candle, and carefully examine the slate.	A slight moisture may be seen.
Refer to damp appearance of roofs of glass houses where many plants are growing, and to the windows of crowded rooms.	Evidently plants, animals, and things that burn in air, give up water in the form of vapour.
If possible, call attention to a bright beam of sunlight from the window, and observe it closely.	We notice innumerable motes or dust particles floating in the air, so small as only to be seen when a beam of light falls in a darkened room.
Sum up the results thus far.	Air is being continually deprived of life-giving oxygen. It receives the poisonous gas—carbonic acid gas—also moisture, and innumerable particles of various substances, are floating about in it.

Additional Information.—The worst impurity of air is carbonic acid gas. In the purest air of mountain or sea it is always present, and averages four parts in ten thousand. It becomes injurious to health when it exceeds six parts in ten thousand.

Plants have two actions on the air. In the process of growing they decompose the carbonic acid gas (CO_2) of the atmosphere, keeping the carbon to build up their tissues, and giving back the oxygen. This is, therefore, beneficial for the healthiness of the air, but it only goes on in daylight.

Plants also respire or breathe, which process goes on day and night. In this process they use up oxygen and evolve CO_2, but on the whole plants are beneficial to the air, and tend to keep down the excess of CO_2. But we see the reason for taking plants out of sleeping rooms at night.

Coal fires, gas, candles, and lamps give off in burning much CO_2. It has been reckoned that one ordinary gas burner vitiates as much air as ten people.

Suspended or floating particles in air may be composed of mud, coal, soot, fragments of plants, animal particles, germs of disease, etc. The close, stuffy smell of rooms is mostly due to animal particles, such as those from the skin, lungs, etc.

Manufactories pour into the air some of their products of combustion, many of which are highly injurious.

Effluvia from sewers, drains, and decomposing animal and vegetable matter are especially dangerous.

STUDIES IN GEOGRAPHY.

BY F. H. SHOOSMITH, B.SC. (LOND.).

II.—THE GULF STREAM.

"There is a river in the ocean.....Its banks and its bottom are of cold water, while its current is of warm. The Gulf of Mexico is its fountain, and its mouth is in the Arctic Sea." Thus wrote the eloquent author of *The Physical Geography of the Sea*, in the days when such ideas were universally accepted; and thus—or words to that effect—write others, more recently, concerning the Gulf Stream, apparently oblivious to the fact that, years ago, Captain Bartlett and other United States hydrographers gave to the world the results of their painstaking observations, which established, among other things, that *the Gulf of Mexico most certainly is not the fountain of the Gulf Stream*, and that its bottom, at least at first, and for a very considerable distance, is not cold water, but rather the bed of the ocean itself.

The latter statement is sufficiently proved by the fact that the shells with which the beds of the Caribbean and the Bahama Seas are strewn are swept north in great quantities as far as Cape Hatteras. Indeed, it is not until 33° north latitude is reached that "a dark-greenish ooze, characteristic of the North Atlantic, begins to be found on the bottom, indicating that at this point the current no longer sweeps the ocean floor, and that the heavier waters from the cold seas of the north are sinking down to displace those of the Gulf Stream."

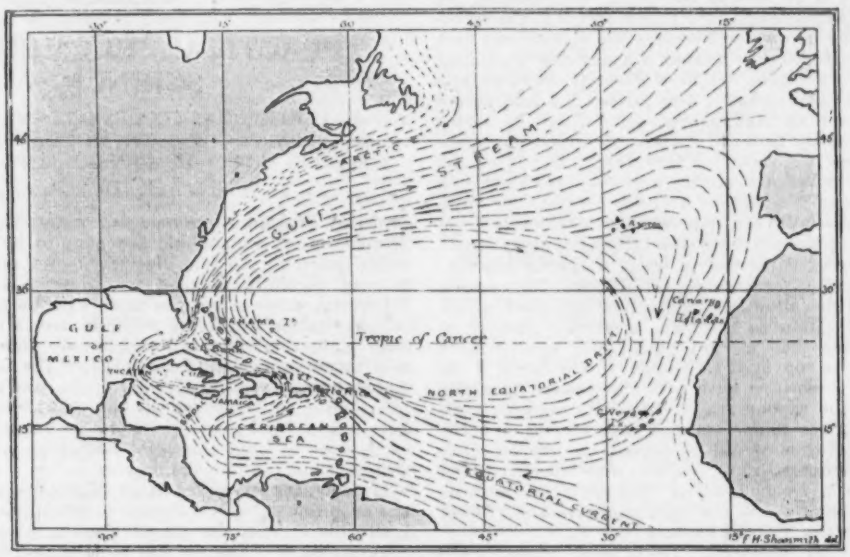
Its name is too firmly established to be superseded, but it is none the less certain that the so-called Gulf Stream is in reality not a *Gulf* Stream at all; or, in other words, that it does not make the circuit of the Gulf of Mexico and then pass outwards along the Florida coast, as is figured in perhaps the majority of text-books. According to these, the

waters of the combined Equatorial Currents enter the Caribbean Sea, pass thence through Yucatan Passage into the Gulf of Mexico, and after making the circuit of that gulf, issue forth as the Gulf Stream. In reality, however, only a very small portion of the great Equatorial Current enters the Caribbean Sea between the Lesser Antilles and the South American coast, and of this small portion very little, if any, finds its way into the Gulf of Mexico.

By far the greater portion of the Equatorial Current unites with the North Equatorial Drift, and flows north-easterly off the east coast of the West Indies; while the smaller portion enters the deep basin of the Caribbean Sea, where "it is partially checked by a shoal extending from Honduras nearly to Jamaica. The current is thus turned round so as to pass eastward along the coast of San Domingo and rejoin the main current near Porto Rico. This washes the north shores of Porto Rico and San Domingo, and is divided by Cuba into two streams, one of which flows on its north side to the Bahama Banks. The other passes through Bartlett Deep, then turns northward through Yucatan Passage, and finally eastward through the Florida Strait, where it unites again with the other stream." It is this combined stream which is commonly known as the Gulf Stream, a name to which, obviously, it has no real claim.

A very important problem in connection with the Gulf Stream is its influence upon the climate of the countries washed by the waters of the North-East Atlantic. It is a commonly-accepted theory that the warm waters issuing into the Atlantic Ocean from the Strait of Florida, at a temperature varying from 80° F. at the surface to 50° F. at 475 fathoms, where they touch the ocean bed, warm up the whole North-East Atlantic and the coasts of the British Isles and Norway. Indeed, one writer recently declared that but for the Gulf Stream "London would be a howling wilderness." But even if the temperature of the stream were 80° F. from surface to bed, the whole of the water passing through the Strait of Florida could not produce one tithe of the effects claimed.

Certainly, according to Croll (*Climate and Time*), the heat conveyed into the Atlantic by the Gulf Stream amounts to one-quarter of all the heat received from the sun by that ocean from Cancer to the Arctic Circle. But then Croll says that "the greater part of the (Equatorial) current.....flows westward into the Gulf of Mexico, and forms the Gulf Stream," whereas it does nothing of the kind. But, not to be captious, we may accept the statement that "but for the Gulf Stream *and other currents* London would have a mean annual temperature 40° F. lower than at present."



THE GULF STREAM.

Instead of a strong current flowing continuously and making the complete circuit of the Gulf of Mexico, it is rather the fact that no well-defined current has ever been noted; although currents of from 1 to 1½ knots per hour have been observed, and that frequently, but *flowing on different days and at different places to all points of the compass.* Indeed, one prominent hydrographer has declared that there is absolutely nothing in the nature of a constant current that need be taken into consideration in the construction of any harbour work.

Exception can also be taken to the statement that this "ocean river" has its mouth "in the Arctic Sea." Beyond 45° N. the course of the Gulf Stream has been disputed, some maintaining that it is lost in mid-Atlantic. It is pretty certain that beyond the 50th parallel it forms a fan-shaped drift, becoming more and more indefinite, until it forms a mass of water subject only to the influence of the wind. Part of it appears to form an undercurrent considerably north of 50°; for Nordenskjöld, sounding along the coast of Greenland, found, a few leagues from the shore, and at a depth of 50 fathoms, a stratum of comparatively warm water, the temperature of which was as much as from 20° to 30° F. above the surface water; and the most reasonable supposition is that this warm stratum is an undercurrent from the Gulf Stream.

How this truly astonishing effect is brought about by these warm ocean currents is a problem usually ignored. To account for it by a direct warming of the land by the impact of the warm waters upon our shores is ludicrous. Nor are the requirements of the case at all satisfied by the further statement that the warm waters warm the winds, and so raise the temperature of the lands over which the latter blow. The statement of Professor Ansted, that if it were not for the "Gulf Stream" the British Isles would be much colder and much less wet, implicitly contains the solution of the problem; for it might be written thus, "If it were not for the warm ocean currents the British Isles would be much colder, *because* much less wet."

The vast amount of evaporation constantly going on from the warm currents from the south is painfully evidenced by the fogs that prevail in the neighbourhood of Newfoundland, where the vapour thus formed is condensed by coming into contact with the cold air in the proximity of the cold currents from the north. Now, as the student of physics is well aware, the conversion of one pound of water into vapour, in whatever way brought about, means the disappearance of an amount of sensible heat sufficient to raise from five to six pounds of ice-cold water to boiling point. Or, more in detail: a thermometer suspended in a vessel of cold water placed upon a fire shows the rise of temperature brought

about by the application of the heat, until boiling point (100° C. or 212° F.) is reached. The mercury in the thermometer now remains stationary, in spite of the continued application of heat, until the whole of the water has passed off in the form of steam, also at 100° C. What has become of the heat supplied during this stationary period? In the days when heat or caloric was regarded as an exceedingly subtle fluid, it was taught that, during the conversion of water into steam, the heat supplied concealed itself in some mysterious manner in the thermometer, and hence it was called *latent heat*. This term is now applied to that heat which is employed in changing the state of a substance—for example, ice into water, or water into vapour—without raising its temperature; and by proper means it has been shown that 537 units of heat are rendered latent in the passage of a pound of water at 100° C. into steam at 100° C, or, in other words, that the amount of heat required to convert a pound of boiling water into steam would raise 537 lbs. of ice-cold water to the boiling point. Further, it must be borne in mind that evaporation is always going on from the free surface of water, at whatever temperature it may be; and not only so, but the lower the temperature, the greater the latent heat, being actually 69·5 calories or units greater for water at 0° C. than at 100° C.*

The relevancy of all this to the climatic influence of the "Gulf Stream" depends upon the simple fact that the reconversion of vapour into water liberates the latent heat in a sensible form. (Hence the infinitely worse effects of scalding by steam than by the same weight of water at the same temperature.) The vast amount of heat carried in a latent form into the atmosphere by the vapour given off in such enormous quantities by the warm ocean currents, is given out again when that vapour is reconverted into water; and if all the rain which falls in our own country were conveyed thither in the form of vapour, it would be a pretty problem for those who revel in statistics to calculate how much heat is thus set free, given so many inches average rainfall over so many square miles of land, every cubic foot of water weighing 62·5 lbs., and each pound of water having given out, say, 537 calories. But, making all due allowance for the fact that much of the rain is brought hither in the form of clouds—that is, of water-dust rather than as water-gas—still, an enormous amount of heat is conveyed in a more or less latent form, and set free in a sensible form over the western countries of Europe, by the vapour arising from the so-called Gulf Stream. Lower the temperature of that stream, and the amount of evaporation would be proportionately lessened, and the mean temperature of our own and other countries be more or less seriously lowered. (Of course there is no suggestion here that *all* of our rain comes from the "Gulf Stream" or from the Atlantic Ocean.)

But this is by no means all. The aqueous vapour of the atmosphere has several extremely important functions. It must be borne in mind that by the term *aqueous vapour* nothing visible or palpable is meant but true aqueous vapour—an invisible, impalpable, transparent gas that is diffused everywhere, even on the clearest day. Now this vapour acts the part of a blanket to the earth, by intercepting the heat radiated from its surface. Tyndall calculated that at least 10 per cent. is thus intercepted and saved from loss within ten feet of the surface. Working upon air brought in impervious bags from various parts of the country, that gifted experimenter demonstrated that the aqueous vapour in each case exerted an absorptive effect seventy times as great as the dry air in which the vapour was diffused.

General Strachey's observations, published long before Tyndall's classic experiments, clearly showed that the presence of aqueous vapour in the air checks the loss of heat from the earth, while its absence favours radiation and increases the nocturnal chill. The fall of the thermometer during the nights of March 1866, when the observations were made, varied from 6° to 16·5°, there being less than half the quantity of aqueous vapour when the latter fall occurred than in the case of the former.

The winters of Thibet are almost unendurable, the extreme cold being due to a great extent to the extreme dryness of the atmosphere. Even in the Sahara, where "the soil is fire and the wind is flame," the cold at night is often painful to bear; and similar testimony is borne by Livingstone in other parts of Africa, and by Stuart in the interior of Australia. In short, wherever the air is dry, the daily thermometric range is extreme—so much so, that Tyndall, after careful experimentation, came to the astounding conclusion that "the removal for a single summer night of the aqueous vapour from the atmosphere which covers England would be attended by the destruction of every plant which a freezing temperature would kill."

To sum up, then, the "Gulf Stream" exerts its beneficial influence upon the climate of Western Europe—as far as the temperature is concerned—in two chief ways: first, by setting free vast stores of latent heat carried into the atmosphere by the aqueous vapour constantly rising from it; and secondly, by rendering the atmosphere moist, and thus providing a warm "blanket," which prevents the otherwise rapid escape of radiant heat from the surface of the sun-warmed land.

* Regnault's formula is: L = 606·5 − ·695T, where T is the temperature (Centigrade) of the water. Thus, in Florida Strait, where the water has a temperature of 85° F., or 29·44° C., we get—

L = 606·5 − ·695 × 29·4
= 586 calories approximately.

Off Newfoundland the temperature of the Gulf Stream is 60° F., or 15·5° C., giving as the latent heat: L = 606·5 − ·695 × 15·5
= 595·7 calories.

PRACTICAL ELEMENTARY SCIENCE.

AN EXPERIMENTAL COURSE COVERING THE REQUIREMENTS OF BOTH THE DAY AND EVENING SCHOOL CODES IN PHYSICS AND CHEMISTRY.*

BY THOMAS CARTWRIGHT, B.A., B.SC.

Natural Waters.—Specimens of water from as many different sources as possible are next to be brought under examination in the following way:—An evaporating basin is very carefully weighed or counterpoised, and is then filled with water, when the basin with its contents is again weighed, after which the water is driven off by heat, and once more the basin is weighed. In this way the pupil will become thoroughly convinced of the fact that natural waters contain solid matter in solution, and a little judicious questioning will establish the fact that this solid matter has been taken up by the water in its passage through the earth. As to what this solid matter may be, the teacher will next proceed to make inquiry.

How Water dissolves Solid Matter.—An apparatus for the evolution of carbon dioxide is fitted up, and marble and hydrochloric acid are placed therein, to the end that a copious supply of the gas may be forthcoming. This current of gas is led into a beaker containing lime-water, when, as usual, the chalk gas and the lime combine together to form chalk, which is deposited in the water as a white precipitate. The new work consists in continuing the current of carbon dioxide for some time after the milkiness has appeared, when a very conspicuous and somewhat perplexing change will be apparent, for the liquid becomes quite clear again. It is quite evident that the chalk has been dissolved, and it is just as certain that the water by itself cannot dissolve chalk, else why was the milkiness produced at the commencement of the experiment? To make this point quite certain, a portion of powdered chalk may be dusted into some water, which should be heated, in order to show that even when heated water has no solvent action upon chalk. What, then, has conduced to the solution of the chalk? It can only be one thing—namely, carbon dioxide—for this alone has been added to the water. It will be very profitable to question and cross-question on this point until the pupil sees quite clearly that water alone has no solvent action upon chalk or limestone, but that water charged with carbon dioxide is able to dissolve these substances.

The Effect of Boiling.—The water in the beaker that was first rendered turbid, and then made clear by the continued action of the carbon dioxide, is now to be subjected

* Books referred to in this series of articles are published by T. Nelson and Sons.

to boiling, after which the change that ensues is to be noted, and to be entered in the laboratory book. Questioning should then be resorted to, in order to disclose the why and the wherefore of the reaction. As the chalk is no longer dissolved, what may we presume has been driven out by the heat? Very little trouble should be needed to get the pupil to see that the effect of the heat has been to drive off the carbon dioxide, and so cause a redeposition of the chalk that was dissolved by the united action of the water and the carbon dioxide that it contained. It will be wise to repeat this simple experiment until it has been thoroughly understood by the pupils.

Application.—It has already been remarked that chalk and limestone are found in great abundance in the earth's crust. What would happen if water charged with carbon dioxide came into contact with these masses of limestone and chalk? Can water become charged with carbon dioxide? Here reference should be made (1) to the fact that there is always carbon dioxide in the air, as may be proved by exposing a saucer containing lime-water to the action of the air—the scum of solid matter that forms is due to the union of the lime with the carbon dioxide of the air; and (2) to the solubility of carbon dioxide in water, as already proved. What, then, will happen to water as it falls through the air upon the earth as rain? Can this water that is thus charged with carbon dioxide come into contact with the limestone deposits? We need only to mention springs and subterranean rivers to get an emphatic assent to this suggestion, and so to establish that the solution of chalk and limestone rocks by water, aided by carbon dioxide, is one of the commonest of natural phenomena; and the teacher may at once pass on to ask what the effect of this solution would be. If the rocks were eaten away, what would be produced as a result? Should there be no satisfactory reply forthcoming, mention may be made of the caves that abound in the limestone districts of Somerset, Derby, and limestone districts generally. How are these caves formed, and why are they found in chalk and limestone districts only? This will certainly elicit the desired reply, and so we pass on to ask where we are likely to meet with this water containing limestone in solution. Does it reach the surface at all? This brings us to springs and rivers and the water supply, and now is the time to go back to our evaporating basin to see whether the solid matter recovered from water by evaporation does really contain limestone or chalk. The pupils should be requested to perform the desired test themselves, which will most readily be done by putting the solid matter in a test-tube and by pouring upon it some hydrochloric or other acid, and finally by conducting the gas, thus set free, into lime-water. A picture of the Cheddar cave of Somerset, or of the Peak cave of Derby, will be very appropriate if it is at hand.

Kettle-Fur, Boiler-Scale, Stalactites and Stalagmites.—The production of limestone by the boiling of spring or tap water (which is, of course, just the same thing) should suggest an examination of the kettle, which may most effectively be done by getting each pupil to bring a piece of the stuff that is to be got from the inside of the kettle, and by making it a class exercise to pour acid upon this, and to lead the resulting gas into lime-water. An inquiry into the origin of this substance will lead to a very useful recapitulation of the whole of what has preceded. The teacher may perhaps be able to procure a piece of the scale of a boiler, and possibly a specimen of a stalactite. If so, the same examination by means of acid and lime-water must be gone through, and again revision will follow in explaining the origin of these substances. The boiler-scale will present no difficulty; but with respect to the stalactite, there is, of course, no boiling—hence the steps in the release of the solid will not be so clear. It will perhaps be best to tell the pupil that the water in its passage through the bowels of the earth takes up very considerable quantities of carbon dioxide, some of which is released when the drop of water trickles through the roof of the cavern, and so frees a thin film of the limestone, which remains as a thin layer upon the roof of the cavern, and this, being repeated again and again, causes the growth from the roof of the icicle-shaped stalactite. Moreover, the water that falls on the floor is still charged with carbon dioxide, some of which it loses, whereby a deposit of limestone is formed on the floor, which grows up to form the conical stalagmites. If a specimen of a stalactite is procurable, it will be advisable to saw it through, in order to show the stratified nature of its structure, since this affords strong confirmation of the explanation just given of its formation.

Hard and Soft Waters.—Each child in the class should be provided with two test-tubes, the one containing hard, the other soft water. A soap solution, made by dissolving some shavings of Castile soap in methylated spirits, is passed round, and each boy is to pour this solution, drop by drop, into each of his test-tubes, shaking up well after each in-pouring, in order to see whether or not sufficient soap has been poured in to produce a lather. The volume of solution required in each case is to be carefully noted and recorded. It will be wise to serve out the soap solution in a small measuring cylinder, whereby the exact volume required in each case to produce the desired lather may be read off. Specimens of the hard and soft water used should next be evaporated, in order to show that the hardness is due to dissolved substances; and a little questioning should elicit the fact that these dissolved substances must be got rid of—that is, be put out of solution—before the water will produce a lather with the soap. It will greatly help to the solving of this problem if a boy is put to wash his hands in hard water before the class. Let him just rub the soap on his hands and try to make a lather. Ask what has become of the soap, drawing special attention to the surface of the water. What is the nature of the scum that always forms before a lather can be produced? It will perhaps take some little skill and time to get the class to see that this is the dissolved matter that has been brought out of solution by means of the soap, which has combined therewith to form the substance that floats on the top of the water, but it is necessary to the proper understanding of the softening of water that this should be done.

How Water is Softened.—It has been shown already that one of the substances, at all events, that help to make water hard is limestone that has been dissolved in water, because of the carbon dioxide that this contains. It has also been shown that when the water is boiled, the carbon dioxide is driven off and the limestone deposited. The pupils should now be able to recognise this as the simplest way of softening water, so far as concerns the limestone, and it is therefore not without reason that washerwomen boil their water before using it. As a third method of softening water, so far as concerns the limestone hardness, the teacher should divide a specimen of hard water into two parts, placing each portion in a separate test-tube. He should proceed to titrate one of these specimens with soap solution, taking note of the volume required to do this, as before. To the other solution he should add a piece of quicklime about the size of a marble, and then without boiling proceed to titrate this second sample with the soap solution. The pupils should be expected to gather from this experiment that adding lime is another means of softening water that is hard because of dissolved limestone. We have thus three methods—namely, (1) **boiling**, (2) **liming**, (3) **soaping**—whereby limestone water may be softened. It should be impressed upon the pupils that hard water sometimes contains many other substances in solution besides limestone or chalk, and that it is much more difficult to get rid of the hardness due to these other substances than it is to dispose of the limestone hardness; hence it is customary to speak of the **temporary** and of the **permanent**—the former being the hardness due to the presence of limestone or chalk, and which can be removed by boiling, liming, or soaping, as already pointed out.

The Economy of Softening Water.—Why do we take so much trouble to soften water? A little thought should obtain an answer to this question from the class. If soap is used in removing limestone, it is not available for cleansing purposes, so that washing operations in hard water require a much greater expenditure both of soap and of time and energy as compared with the use of water that is soft.

How Chalk is Formed.—As water so usually contains limestone in solution, there should be much of this sub-

stance in springs and rivers, and much more in seas and oceans. In order to suggest what becomes of some at least of this dissolved limestone, the shells of oysters, mussels, crabs, lobsters, etc., should be examined by means of acid, when it may be shown that they all behave in exactly the same way as chalk and limestone towards these reagents; after which the pupils should be told that they all consist of limestone, and that marine forms of life have the power of taking the limestone from water in order to form their hard parts. Here will be the appropriate place to mention the coral polyp, and to furnish illustrations of the growth of this misnamed coral *insect* and its connection with the formation of coral reefs and islands. Of course, the chief point to insist upon will be that coral rocks are limestone rocks, and that they could not exist were it not for the limestone that is held in solution by the waters of the ocean; but a most interesting lesson might usefully be devoted to the subject of the formation of coral limestone alone. Bearing more directly upon the formation of chalk will be the mention of the minute globigerinæ; and as specimens of this mud can be obtained at very small cost, the teacher should not fail to have a specimen for the lesson. Further, if a microscope is available, a slide showing globigerina ooze should be purchased (it will cost only 1s. 6d.), and another slide should be prepared by scraping some chalk into water, and by placing a very thin film of the chalk ooze thus produced on a glass and covering it over with a cover-glass. An examination of the two slides will not fail to convince the pupils that the two substances —namely, the ooze from the bottom of the sea and the scrapings of the chalk—are identical; and it will only remain to give an account of the formation of the ooze by the death of the globigerinæ, and the consequent deposition of their limestone skeletons at the bottom of the ocean. It will possibly be objected—and it will be fortunate if it is —that an incalculable number of these minute organisms would be required to make the chalk found in Britain alone, to say nothing of other parts of the world. The answer is, that the number of the globigerinæ is so great that the dropping of their minute chalk casts to the ocean floor may be likened to a continuous rain of chalk dust, and that thousands of years were spent in depositing the ooze that we now know as chalk rocks. To conclude the story, it will be necessary to add that most of our country at one time was at the bottom of the sea, and that such upheavals as have converted an old sea-bottom into ranges of hills are known to have occurred very extensively, and are in process of occurrence at the present time.

OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK.

NIGERIA.

ON January 1, 1900, some 500,000 square miles of territory, with a population of twenty-five million souls, were quietly and unostentatiously absorbed by the British Empire. "John Company," the forerunner of empire, had diligently prepared the way, and the territories, rights, and concessions that had been secured by treaties with the native chiefs were assigned to the British Government in consideration of a sum of over three quarters of a million sterling. Hitherto the territories in these regions had been under three different forms of administration: Lagos was under the Colonial Office; the Niger Coast Protectorate was administered by the Foreign Office; and the Royal Niger Company ruled over the vast area beyond. These three forms of government did not always work in harmony; but now all the territories come under the administration of the Colonial Office.

The description of a region so extensive and so diverse in its configuration, with varying climatic conditions, and a chaotic and remarkable jumble of native races, cannot be easily presented in a few sentences.

The low lands of the coast region present the same undesirable features common to the whole of the West African coast—densely-forested, reeking swamps, where the dripping mangroves overhang the steaming mass of vegetable putrefaction below that will not bear the weight of a human being. The foul exhalations from the accumulations of ooze and mud, together with the intolerable plague of mosquitoes, cause a frightful mortality among Europeans.

The Niger Coast Protectorate is known as "the Rivers," and includes a mystifying network of channels and creeks, extending from Lagos to the Kameruns. The inhabitants are among the most degraded that West Africa can produce. From their natural surroundings they contract loathsome

diseases; their conceptions of religion are incredibly low; and the shedding of blood plays a conspicuous part in all their religious and even in many of their domestic customs.

It is discreditable to Europeans generally that four hundred years' contact with the white man should not have elevated the native races somewhat in the scale of civilisation. First this region was the hunting-ground of the white slave raider and trader, whose unholy traffic transported the victims to the plantations of America; and in more modern times it has been flooded with intoxicating liquors of the vilest description.

Sir Claude Macdonald made a tour of inspection up the Niger in 1892, and a member of his staff wrote as follows:—

"The importation of cheap and vile spirits into the seaboard countries of the Niger Protectorate has, for the past century or more, been the utter ruin of the natives. Most of the people of the Delta have become confirmed drunkards."

"Rivers" gin was shipped to all the ports along the coast. The green cases each held twelve bottles and one and three-quarter gallons. The price varied from 1s. 11½d. to 3s. per case (case, bottles, and gin inclusive).

The price of the spirit is sufficient comment upon its quality. It is, in fact, little better than fusel oil, that produces faintness, paralysis, and general demoralisation. The extent of the evil is best gauged from the figures referring to the Protectorate:—

Total revenue for 1897	£237,857.
Revenue derived solely from spirits	£132,000.

Little wonder that the Colonial Office awoke to its duty, and placed the liquor traffic under severe restrictions.

The same state of affairs also existed in Lagos, and had not the vile trade been checked, the new railway which already extends from Lagos to Ibadan would have found its chief freights in the green cases of Dutch and German gin.

In 1897 it was necessary for a British punitive expedition to proceed to Benin, the road to which was marked out by horribly-mutilated corpses, sacrificed in the hope that the invaders' steps would be turned. The commander wrote:—

"The one lasting remembrance of Benin in my mind is its smells. Crucifixions, human sacrifices, and every horror, the eye could get accustomed to; but the smells no white man's internal economy could stand. Every person who was able, I should say, indulged in a human sacrifice; and those who could not, sacrificed some animal, and left the remains in front of his house. After a day or so the whole town seemed one huge pest-house."

No other words could better depict the degradation of the natives of "the Rivers."

Lagos Island has an area of four square miles, but its influence extends over 1,500 miles, chiefly the country of the Yorubas, one of the most promising of the West African races. Palm-oil, palm-kernels, and rubber are the chief exports. The trading statistics show gratifying increases:—

	1897.	1898.
Imports from United Kingdom	£574,000	£723,000.
Exports to United Kingdom	£400,000	£1,129,000.

In the River Protectorate the trade during the same periods was almost stationary.

Northern Nigeria possesses many distinct promises of general development in the future. The climatic and ethnologic problems do not present nearly so many difficulties as in the Delta regions. Its area is estimated at about 310,000 square miles, and includes the Sokoto Empire. **Lokoja,** the headquarters of the administration, is connected by telegraph with Lagos, and the line is being carried on along the Benue. There is, too, a river mail service: Southern Nigeria conveys its own mails as far as Idda, on its northern boundary, beyond which the service is controlled by Northern Nigeria.

British occupation of Northern Nigeria presents several features of speculative interest, especially in connection with the empire of Sokoto, all of which vast region is under the Fulani yoke. This powerful Mohammedan people has built up a state of society which will require special tact and consideration from its new rulers. As in the case of other Mohammedan conquerors, the power, riches, and opportunities that followed conquest have, in their turn, been followed by lassitude and a feeling of security which have paved the way to indulgence and national decadence.

In dealing with this race, we have to overcome native antipathies and religious prejudices, and, above all, we have to contend with slave-raiding and domestic servitude. In these regions the whole state of society rests upon domestic slavery. Raiding may be suppressed, but any interference with domestic servitude might involve us in a religious war, of which we have had examples in other parts of the world. On the other hand, if we strengthen the hands of the native emirs, and introduce reforms gradually, we may gain the confidence of a race that may render us valuable service in placing British rule upon a prosperous and successful basis.

The whole territory beyond the Delta is rich in vegetable wealth, and minerals are known to exist in considerable quantities. In addition to this, however, there is a teeming population to whom our manufactures are absolutely unknown—one vast market hitherto unworked. British rule will bring such tranquillity to Nigeria as it has never before known, and will allow full scope for those administrative and commercial measures which will profit the traders of the mother country, and bring enlightenment and comfort to the millions of dusky subjects.

The New Cable.—A new cable is to be laid from Vancouver to Queensland, connecting the Commonwealth of Australia with the Dominion of Canada. A branch cable of 537 miles will carry the messages to New Zealand. At present, when telegraphing from Canada to Australia is necessary, the message must be sent first to England, next across Europe to Egypt, then by the Indian Ocean to India, and finally by a devious route to Australia.

A New Glucoside.—Schlagdenhauffen and Reeb have recently made an interesting discovery of a new glucoside, to which they give the name of erysimin. It occurs in the seeds of several species of erysimum, especially *E. aureum*, as a pale, amorphous mass, soluble in all proportions of water and alcohol, and insoluble in ether, chloroform, benzin, and carbon sulphide. It is slightly hygroscopic, and melts at 190° C. It acts as a heart poison when injected into frogs or pigeons. Erysimin belongs to the class of digitalins, and closely resembles the glucoside of the wallflower.

HISTORY UNDER THE PRESENT CODE.

BY THE HEAD TEACHER OF A LARGE BOARD SCHOOL.

A Scheme of Instruction for Standard V., combining Lessons in History, Composition, Reading, and Recitation.

IN the previous courses of history lessons an attempt has been made, on the one hand, to keep as nearly as possible to previous Code requirements in geography, and, on the other, to provide the children with some connected knowledge of English history up to the end of the Plantagenet period. With Standard V. a new difficulty awaits us: How are we to connect the geography of Europe with suitable historical lessons? An authority on the teaching of history (Professor Withers) suggests at this stage the biographies of heroes and heroines of European history. This should form an admirable solution of the difficulty; but if we desire to make the historical teaching *continuous* through the standards, we must seek another answer. Shall we sacrifice the geographical requirements, or the continuity of the history lessons? A middle course suggests itself, as the following scheme will show:—

Geography.—General geography of Europe (as in previous Codes).

History.—England under the Tudors (a continuation of lessons in Standards III. and IV.).

(*a*) Lessons on "The England of Elizabeth:"—

1. Improvements in the condition of the people.
2. The Poor Law—partially result of suppression of the monasteries.
3. The rise of English manufactures.
4. Consequent increase of commerce.
5. Maritime discovery and exploration.
6. The "Golden Age of Literature."
7. The struggle with Spain.

(*b*) Lessons on the Life and Work of—

1. Thomas More.
2. Cardinal Wolsey.
3. Philip Sidney.
4. Francis Drake.
5. Shakespeare.
6. Walter Raleigh.

(The biographies (*b*) will supplement the instruction given on the events (*a*), or *vice versâ*.)

Composition.—Reproduction of suitable historical stories in connection with the above—for example, "Sir Walter Raleigh's Cloak," "Sir Philip Sidney at Zutphen," etc.

Reading.—Charles Kingsley's *Westward Ho!*

Recitation.—Tennyson's *Revenge.*

In this syllabus the connection between the geographical and historical lessons is slight and fragmentary. The opportunity for correlation comes with the history, composition, reading, and recitation, each of which will naturally help and illustrate the other. The stories in history thus reproduced will be found far more educative than the inane narratives very often read to Standard V. No better reading matter can be desired than *Westward Ho!* and its illustrative value is immense. The same can be said for the poem. Suitably worked out, this year's work provides the children with vivid ideas of the England of Elizabeth, and the position of England to-day in relation to the continent of Europe.

Standard VI.

Probably few teachers will wish to change the present Standard VI. work—the geography of the British Empire—nor need they seek far for suitable history lessons in connection. From the age of Elizabeth the history of England is the history of the British Empire, and no course of lessons on Greater Britain is complete without a brief history of each colony acquired.

BROWN PAPER ILLUSTRATIONS FOR LESSONS.

BY EDITH E. BAMFORD, ART TEACHER, EDGE HILL TRAINING COLLEGE.

IN previous papers only blackboard illustrations for lessons have been described. But blackboard space is limited, and these illustrations have often to be destroyed immediately after or even during a lesson, in order to make room for others. This is evidently a great disadvantage, for the drawings might be wanted for future lessons; and even when only one lesson is given on a subject, the illustrations, left where they can be seen by the class, serve as a record of the most important points, and recall them to mind.

Again, the blackboard is not a good medium for shading, and where the modelling of a figure or an object has to be represented, it cannot be very successfully worked on the blackboard.

In cases where shading is required, and where the illustrations have to be kept for some time, brown paper, chalk, and charcoal are, *par excellence*, the best materials to use. It is astonishing how quickly a bold, effective sketch can be made with these simple and inexpensive materials—ordinary brown paper such as is used for parcels, sticks of sketching charcoal which can be bought at any artist's shop three sticks for one penny, and white blackboard chalk. In order to test the comparative ease with which effects can be obtained by means of these materials, and the boldness and clearness of the results, it is only necessary to make shaded drawings on brown paper, white paper, and the blackboard, and then consider the time spent on the three sketches, and their general effect. Artists realise the value of tinted paper, and generally use it for their rough sketches.

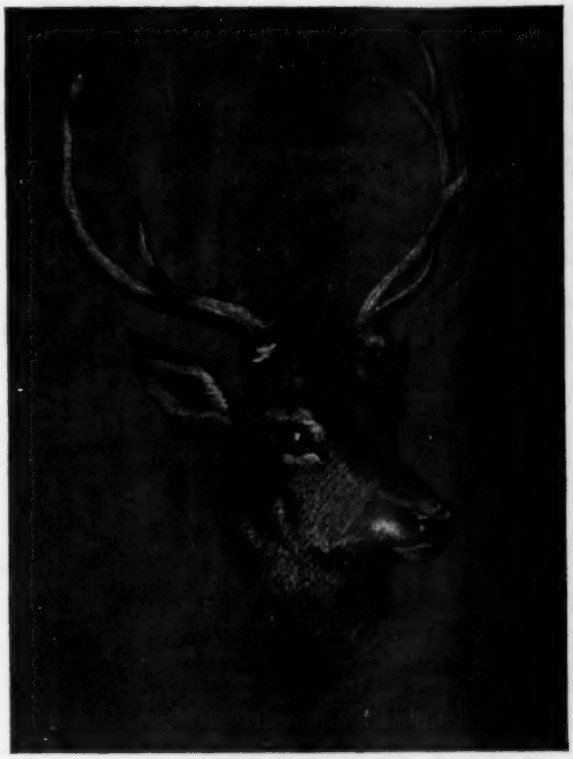
Much time is saved by using brown paper, for it represents the middle tone, the most general tone in an illustration, without being shaded; and the chalk and charcoal are so soft and so easily applied that with a few minutes' work a strong, clear sketch, fairly well modelled and in high relief, can be made. The high lights and dark tones could be worked with crayon pencils instead of chalk and charcoal, but these are so hard, comparatively, that much time has to be spent before an effect can be produced. But crayon has this advantage over chalk and charcoal; that it does not smudge so readily; and sketches made with the latter have to be carefully treated—they should not be rolled up or rubbed in any way.

When making an illustration, a large sheet of brown paper may be fastened with drawing-pins to a blackboard on an easel. The rougher side of the paper should be used, as the charcoal skids over a smooth surface, and leaves no impression. The general rules for sketching are the same as those for blackboard drawing. The worker should stand well back from the easel, in order to obtain correct proportion on a large scale, and to see the effect of the shading. The outline should be lightly sketched in with straight lines as far as possible, the charcoal being used for the dark parts and the chalk for the light parts of the outline. The charcoal outline can be easily corrected, for it is readily removed by flicking it with a duster; but the chalk adheres to the paper, and if it is heavily worked it is difficult to remove. The outline can generally be improved and details added during the shading, but time should not be wasted on obtaining accuracy in unimportant details.

The shading should be next worked, but only absolutely necessary shading should be added. At first there is a tendency to cover all the brown paper with shading, but this is a waste of time; it should be left untouched for the middle tone. A good method of shading is to rub the chalk or charcoal up and down over a short distance at an angle of about 45°; but no hard and fast rule can be given for the method of work. The lines need not be softened with a stump, for the roughness of the near effect will probably not be noticeable in the distance. Charcoal should not be worked over white chalk, or *vice versâ*, as this gives a dirty gray tone. The general principles learned in light and shade drawing should be considered and applied, and a little practice will give the experience necessary for determining the most suitable methods for particular sketches. Occasionally, for very light and very dark tones, the chalk and charcoal have to be applied with considerable vigour.

TIGER.

Sketches made on brown paper are specially useful for illustrating geography, history, object, and kindergarten lessons; and physiological and anatomical diagrams can also be successfully worked on it. A lighter gray tinted paper might be found more suitable in the latter cases; but, throughout, the ease and rapidity with which the charcoal and chalk can be applied will recommend these materials strongly to the use of the teacher who has to make shaded drawings as illustrations for his lessons. If the blackboard space is limited, even outline sketches, maps, plans, etc., can be successfully worked in charcoal or coloured chalks on brown paper, though the blackboard is the best background for such drawings.



STAG'S HEAD.

ICEBERGS.

Photographs of three brown paper sketches enlarged from illustrations in reading books are here reproduced, but unfortunately in the photographs the high lights seem stronger and the dark tones less strong than in the sketches.

A Stag's Head.—This is an easy and effective subject, and here the method of applying the chalk and charcoal can be seen. As a rule, the eye of an animal presents difficulties if it has to be sketched on a large scale, but it can generally be represented by leaving the brown paper untouched, or only slightly shaded with charcoal, for the eyeball, using the charcoal heavily for the iris and pupil, and the chalk for the gleam in the eye.

A Tiger.—This has been selected as a type of an animal form. If, as in this case, the animal has a brown fur or skin, a particularly good effect is obtained by means of the brown paper. As little shading as possible has been introduced on the body, and only a suggestion of the background has been added. It is well to indicate the cast shadows clearly, as they seem to give finish to the sketches.

Icebergs.—This is a more ambitious subject than the others, and in effect is not so successful, for, as a rule, the sketches requiring little but strong shading are the most effective; it serves, however, to show the direction of the shading lines, and the method employed.

THE INSPECTOR'S NOTEBOOK.

BY AN INSPECTOR OF SCHOOLS.

INFANT SCHOOL WORK—(*Continued*).

The Question of Discipline.

I BELIEVE that many teachers still find it difficult to decide upon the standard of discipline for an infant school. Still more find it no easy matter to attain to the ideal they have conceived. Let me begin by avowing that, in my opinion, the discipline should not be tested by the children's capacity to rival the rigidity of composure of *tableaux vivants*. It is unnatural, if not cruel, to expect infants to keep from moving for many minutes together. Discipline is much more than a question of sitting still at a word of command. Then, again, it is a relative matter. You have one standard for the babies and another for your eldest scholars. Hence the necessity of keeping the babies in a room apart from the rest of the school. Good discipline will only be procurable where the teacher is in close sympathy with the children, and has so studied their natures as to be able to arrange a curriculum that will not place an undue strain upon their powers of mental and physical endurance.

Wherein the Secret lies.

The born teacher has no trouble in preserving order. She has the power of control and sympathy innate, and it is as easy for her to sway her little kingdom with her eye as it is for a bird to fly. I cannot help coming to the conclusion that, especially with infants, the power of the successful teacher is a natural gift. There are many, however, who, by dint of perseverance, can obtain sufficient of that wondrous power of tongue and eye to make successful infant teachers. But there are many who will never rise above mediocrity. As the majority of us belong to the middle class, let us consider a few accessories which may help us. Study carefully child-nature, and then so construct your time-table that it will encourage attentive habits. Many teachers expect infants to sit still and listen to an object lesson for thirty or forty minutes, and are annoyed with themselves because general restlessness appears after the lesson has proceeded for about fifteen or twenty minutes. Learn from the children. If it is evident that twenty minutes on the tallow candle is sufficient, why persist in continuing for half an hour?

Remembering that you are dealing with children in the active stage, do not try to thwart their natural tendencies, but, on the other hand, make use of them by giving them something to do whenever possible.

The teacher's duty is to follow the children as well as to lead them. A successful teacher can interpret the feeling of her children, and adapt and re-adapt herself constantly to meet the varying moods of her little ones.

The Nature or Object Lesson. The nature lesson or object lesson should come very early in the day, and, generally speaking, the other lessons should be made to bear upon this first lesson. There is no need to draw up a stereotyped list of thirty object lessons. In fact, one is heartily sick of seeing some such list as this:—The Cat, The Dog, The Elephant, The Tiger, The Ostrich, The Eagle, Spring, Summer, Autumn, Winter, Rain, Snow, Ice, A Railway Station, The Shoemaker, Pens, Lead Pencil, Tallow Candle, etc. Lessons upon many of the above must, of necessity, be of a very perfunctory and lifeless nature. In such a way does many a teacher handicap herself. An excellent scheme may be found in the March and April numbers of this magazine. Contrast, for instance, the snowdrop, the primrose, the crocus, the bluebell, with the elephant, the tiger, the reindeer, and the ostrich. Show the children a daffodil, and watch their eyes sparkle. Then place before them a picture of an elephant. Note the different effect.

To cultivate Powers of Observation and enlarge Vocabulary. We will now consider the object lesson scheme in its entirety. I often say, "Why twenty or thirty lessons for the year's work?" The reply comes occasionally, "We find we can only manage to teach thoroughly that number." Now, may I suggest that the question be looked at from another point of view? How far is the needless repetition of any one lesson, and the remembering of the facts dealt with, necessary? Are not the chief objects of the lesson to train the powers of observation and enlarge the vocabulary? If so, let the remembering of the facts go. It will then follow that it will be more interesting, and possibly educative, to deal, not with twenty or thirty lessons, but with perhaps fifty or sixty. The larger the number of objects we can deal with, the more extensive will be the vocabulary, and the better shall we be able to train the powers of observation.

Teach the Infants to talk. One of the most important objects in an infant school should be to train the children to talk. This can be done exceedingly well in the object lesson. There is often a striking difference between one child and another of the same age in this respect. The child who comes from the home of cultured people will ask questions and talk freely. The aim should be to get the other less-favoured children to do the same kind of things. Indeed, if the teacher talked much less, and the infants much more, progress would be more distinctly marked.

Fairy Tales. There is so much talk nowadays respecting *concrete* teaching that I am sometimes asked if such things as fairy tales should be told to infants. Most certainly. By so doing you are training the imaginative powers, and perhaps inculcating ethics. After all, there is a simple test for all such problems. Are the children delighted to hear of Red Riding Hood and Pandora's box? If so, why should they be denied? for surely if they are attentive they are being educated. My experience is that fairy tales well told entrance infants as much as the most interesting object lesson.

Drawing. Drawing in infant schools is receiving much more attention than used to be the case. The girls should be taught as well as the boys, in spite of the fact that they have needlework to do. Drawing is one of the most important subjects, and is almost as useful to girls as to boys. Certainly, if considered as a means of expression, the girls need it equally with the boys.

This subject should be closely connected with the rest of the curriculum. How this may be done in detail will be seen by reference to the scheme of a practical infant teacher given in the April number. Drawing on squared slates and paper is being discontinued. A freer and more educative system is taking the place of the old kindergarten drawing. Drawing on blackboards with chalk is the best development at present, accompanied by brush drawing. Generally speaking, drawing from actual objects is better than building up from conventional forms.

Answers to Correspondents.

W.B.J.—There is no need to read and write again. Take the examination. If you succeed, it will be equal to a second.

A.O.—The pledge is only binding until you have obtained your parchment. It is not intended to deter you from ever leaving the profession.

Article 62 (b).—This article settles the question in your favour, since your pupil teachers attend central classes, and you have been specially recommended for practical skill. No definite certificates under Article 62 (b) ii. are issued.

J.H.Q.—You can take the second year examination next year, when there will be only *one* examination for both years. (See note at end of Certificate Course.—Ed. *P.T.*)

Letters should be addressed—"Inspector, care of the Editor." Replies will, as a rule, be given only in this column. Only those letters reaching me by the 3rd of the month can be answered in the succeeding number of this magazine.

Staff Sight-Singing in Elementary Schools.—Mr. John Taylor, sole professor of sight-singing at the Guildhall School of Music, and the well-known author of the stave sight-singing method, gave an important demonstration of his method recently to a large gathering of members of the West Ham Teachers' Association, at the Board School, Water Lane, Stratford, E. The association was well represented officially, the chair being taken by Mr. R. T. Mawbey, president, supported by Mr. Ralph Soar, secretary, and other members of the executive.

The following was the syllabus of the lecture:—"Fallacy of reputed difficulty of teaching staff sight-singing in elementary schools. Stave sight-singing method with its central appliance. The stave modulator. Twofold aspect of the method. Some main uses of the stave modulator. The teaching of time: the time frame; association of time and tune."

The lecturer began by describing the twofold aspect of his method—namely, (1) as an independent and direct staff plan, easier with even infants than tonic sol-fa; and (2) as an instantaneous leap from the tonic sol-fa to the staff at any desired stage. The first use of the method had been established up to the hilt by its successful and exclusive use in all army infants' as well as elder children's schools for the last twelve years; the second, in its very extended general adoption, notwithstanding certain administrative codal complications, in boards, colleges, schools, and other educational institutions both at home and abroad. A striking confirmation of the value of the method as a guide to the staff from tonic sol-fa was found in its voluntary and welcome adoption in many London Board schools, as a result of Mr. Taylor's recent course of lectures before that body.

Turning to practical work, the lecturer proceeded, with the aid of twelve boys supplied from the Cann Hall Lane Board School, Wanstead, E., and totally unacquainted with the staff, to teach the whole of the time requirements of divisions 1 to 4 of the Education Code in a few minutes, which feat he successfully accomplished by means of his stave modulator, an appliance answering all purposes of staff teaching in the same way that the Curwen modulator does those of tonic sol-fa. At the end of some three-quarters of an hour the boys were able to sing passages in various keys at sight from the blackboard, and with different clefs. Having thus exceeded the bounds of the Code, Mr. Taylor continued to show still higher possibilities of the method by dividing his whole audience into a two-part choir, and, through a process of double-pointing upon his stave modulator, including extemporised passages involving minor and chromatic progressions and modulation into a variety of keys. The ease of teaching the bass and other clefs was also shown, and examples were sung at first sight by the boys from the old soprano (C) clef in the keys of B flat and D. The subject-matter of the lecture ended with a short exposition of the simple way in which time, and time and tune combined, are now taught by means of the lecturer's contrivance known as the time frame. Mr. Taylor, who was listened to throughout with marked attention, liberally interspersed his remarks with references to the fundamental teaching and scientific principles underlying both the subject of staff sight-singing itself, and also of the stave sight-singing method, as being its closest and simplest exponent.

The proceedings terminated with a vote of thanks to the lecturer, which was carried with acclamation.

RECENTLY PUBLISHED.

PUPIL-TEACHERS' NOTEBOOK.

By A. T. Flux. Interleaved with Ruled Writing Paper for Notes. Cloth limp. Price 8d.

This Book contains, in a convenient form for memorising, all the chief points set in English for Pupil Teachers, and includes the prefixes and affixes; English, Latin, and Greek roots; words derived from persons and places; common quotations and abbreviations; a short sketch of the history and growth of the language, etc., etc.

Thomas Nelson and Sons, London, Edinburgh, and New York.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Principal of the Belvedere Pupil Teachers' Centre, First on Scholarship List; Author of "Scholarship School Management," "Building of the British Empire," etc.

SPRING EXAMINATION, 1902.

Third Month—June.

WORK TO BE PREPARED.

1. READING AND REPETITION.

CONTINUED oral practice in these subjects is very essential to success. Read to understand.

2. ENGLISH.

Candidates.—Gray's *Elegy*, verses 9–12. Learn derivation of all important words, and pay especial attention to the suffixes.

Analyse the whole, and parse all words presenting any difficulty.

First Year.—Cowper's *Expostulation*, up to line 80, or *The Task*, Book V., lines 41–69.

Second Year.—*Paradise Lost*, Book III., lines 134–202, with derivations, etc.

3. COMPOSITION.

Write one or two essays each week from the list in *The Pupil Teacher's English Notebook*. Take great care with this exercise. Read up the subject set if necessary, and always draw out a sketch or plan on which to write.

4. HISTORY.

Candidates.—Henry III., Edward I., Edward II., Edward III., and Richard II.

First Year.—Richard, John, and Henry III.

Second Year.—Charles II.

5. GEOGRAPHY.

Candidates.—The northern and the eastern counties.

First Year.—Holland, Belgium, and Scandinavia.

Second Year.—Africa (British possessions).

6. ARITHMETIC.

Candidates.—Vulgar fractions.

First Year.—Commission, brokerage, and insurance.

Second Year.—Compound interest and stocks.

7. ALGEBRA AND EUCLID.

First Year.—Euclid: Props. 5–8, with two deductions each week. Algebra: multiplication.

Second Year.—Euclid: Props. 35–38, with four deductions each week. Algebra: fractions, involving the use of factors.

8. MUSIC.

Candidates.—Measures and pulses.

First Year.—Measures and divisions of the pulse.

Second Year.—Relative pitch of keys.

Notes on the Work for the Month.

1. ENGLISH.

N.B.—The Board of Education has announced that they will accept Cowper's *Expostulation* or *The Winter Morning Walk* from first year pupil teachers. Students are advised to take the former, and procure THE PRACTICAL TEACHER edition—now ready.

Gray's *Elegy*. *General Paraphrase (continued)*, verses 9–12:—

Verse 9. Death is the end that awaits all men—those who boast of a long descent, those who during life wield great power, those distinguished for great beauty or vast wealth; the grave is the ultimate reward of all glory.

Verse 10. It is not the fault of these humble villagers that their memory is not preserved by some elaborate tomb, or that they were not buried in some beautiful old cathedral with the accompaniment of sacred song.

Verse 11. The life cannot be recalled to the dead body by any monument or statue; the call of honour is unheard, and flattery falls unheeded on the lifeless corpse.

Verse 12. And yet, perhaps, in this quiet churchyard there may be laid one whose heart glowed with poetic fervour; who might, under other circumstances, have guided the destinies of nations with brilliant success, or produced the most entrancing music or poetry

Notes on Parsing and Analysis.

Verse 8. *Let.* Note that this verb is nearly always followed by a noun and an infinitive—that is, ambition is objective case, governed by *let*. *Mock* = *to mock*, an infinitive.
Understand *nor let* before grandeur.
Poor. Collective noun.

Verse 9. Note the inversion. The prose order is, "The inevitable hour awaits the boast of heraldry, the pomp of power, and all (that beauty gave), and all (that wealth e'er gave)."
In the subordinate adjective sentences, *that* is the objective case, governed by the verb.
But. Adverb, modifying the phrase *to the grave*.

Verse 10. *Ye* is used with a certain demonstrative force in cases like this.
Proud. Collective noun.
Raise. Subjunctive mood.
Trophies. Objective case.

Verse 11. Read, "Storied urn or animated bust—can call the fleeting breath back to its mansion."
Can is not to be taken as an auxiliary, but as the principal verb, taking for object an infinitive phrase.

Verse 12. *Perhaps.* Adverb of doubt, modifying *is laid*.
Some. Demonstrative in this case. Note the different use in *some bread, some apples*.
Once. Adverb of time, modifying *pregnant*.
Supply, *perhaps in this spot are laid hands*, etc. Note the order: *that—might have swayed—the rod of empire*, and *that—might have waked—the living lyre to ecstasy*.
Might have waked. Subjunctive mood, perfect tense.

COWPER'S "TASK," BOOK V.

General Paraphrase.

1. It is a winter morning, and the sun, just rising above the horizon, tinges everything with a ruddy hue. The clouds, driven away before the wind, catch the colour; and, as the sun rises higher, seem like the conflagration of some great city seen through a wood in winter. The rays of the sun, falling obliquely on the snow-covered valley, have no power to warm the earth, but cast from every upstanding herb and tuft of grass a long shadow. My own stretches far across the field, and in spite of the sobering thought that man is but a shadow, I am bound to smile at the attenuated form and grotesque shape of the image thrown on the snow. A long, lean pair of legs keep step with me, and as I pass the cottage wall appear without the body.

21. The grass is buried deep under the brilliant snow, but the coarse grass stems and longer tufts that at ordinary times are either unnoticed or appear to disfigure the general level, now clad in crystalline feathers and illuminated by the sun, assumed an unwonted beauty. The cattle collect into some sheltered corner, and stand sadly in a pensive attitude. They are waiting for their morning meal, but, unlike man, do so in patient meekness, and without any grumbling protest. With plodding step the cow-man makes his way to the rick, and, seizing the broad knife, proceeds to cut out, with many a vigorous stroke, the necessary fodder. He cuts it out so straight that the rest of the stack stands as upright as a wall—a precaution which is necessary, as the wind would blow it down, or it would topple over by its own weight.

41. The woodman comes out of his cottage and tramps off across the snow, leaving the village behind him, on his way to the distant woods, where he works alone throughout the length of the short winter day. His only companion is his dog—half lurcher, half cur, rough coated, with erect ears and docked tail.

Sometimes he walks along quietly at his master's heels, but now and then he scampers over the field, snatching at the snow or ploughing his nose through it and barking with joy.

The woodman takes no notice of this exuberance of feeling, but walks steadily on, pausing only to press down the tobacco in a short pipe he is smoking, the fragrant fumes of which trail far behind him.

58. The poultry come forth from the fowlhouse or the neighbouring hedge, where they have been waiting for the approach of day, and in obedience to the well-known call of the housewife, flutter across the snow, half flying and half walking, as if they knew the inability of the snow to support them.

The sparrows, twittering under the eaves, are prompt to notice the abundant supply of corn spread around, and sally forth to steal the food, yet hesitate, and fly away at every movement, only to return again with their accustomed pertness.

Notes on Parsing and Analysis.

Line 4. *Ardent.* Adjective, qualifying *clouds*.
Line 11. *Mine.* Nominative to *provokes*.
Line 13. A noun sentence in apposition with *remark*.
Myself. Pronoun, emphatic.
Line 14. *Askance.* Adjective, qualifying *eye*.
Line 17. *To mock me.* Object of *designed*.

Line 20. *Sight.* Objective of exclamation.
Legs, in apposition with *sight*.
Line 21. *Buried.* Participle used proleptically after *lies*.
Deep = *deeply*. An adverb.
Line 24. *Of late* = *lately*. Adverb of time.
Line 26. *Superb* for *superbly*.
Line 28. *Half-petrified.* Adjectival completion of *seem*.
To sleep. Infinitive, modifying *half-petrified*.
Line 30. Supply *waits* at the end of the line.
Line 34. *Deep.* Adverb, modifying *plunging*.
Plunging. Present participle, qualifying *he*.
Line 35. *Knife.* Objective case, governed by *deep plunging*.
Line 38. Read, *this is no needless care*.
Line 40. Read, *or lest its own unbalanced weight should overturn the leaning pile*.
Line 44. *Task.* Either supply *this is* or take it in apposition with *to wield* and *to drive*.
Line 46. *Lurcher* and *cur.* In apposition with *dog*.
Line 47. *Close.* Adverb, modifying the phrase *behind his heel*.
Line 53. *Right.* Adverb, modifying the phrase *toward the mark*.
Line 57. *Far.* Adverb, modifying the phrase *behind him*.
Line 59. *To catch.* Infinitive, modifying *diligent*.
Line 60. *Side by side.* Adverbial phrase.
Line 62. *Half.* Adverb, modifying *on wing*.
Line 69. *Kind.* In apposition with *they*.

The opening lines of the poem form an excellent example of the truth and fidelity with which the author depicted the rural scenes and customs of the district in which he lived. The graphic pen-picture of the woodman and his dog is inimitable, and to the most elementary critic is evidently a study from life. The first hundred lines should be taken for the repetition.

Second Year.

MILTON'S "PARADISE LOST," BOOK III.

This is dealt with fully in the edition (Nelson's) recommended. It is very helpful to write the poem out in correct prose order before attempting to paraphrase, analyse, or parse.

2. HISTORY.

Candidates.—The chief points to which attention should be directed, and on which all should be prepared to answer a question, are :—

1. A life of Hubert de Burgh, the last of the great Justiciars.
2. Henry's misgovernment. The Barons' War. Mad Parliament.
3. De Montfort's Parliament; the first calling of the Commons.
4. Edward's conquest of Wales. Edward's conquest of Scotland.
5. The great statutes and law reforms (for example, Winchester, Westminster, Gloucester, Mortmain).
6. Edward the Second's favourites.
7. Bannockburn (prepare a plan) and Scottish independence.
8. The Hundred Years' War; its causes and events.
9. The Black Death and Statute of Labourers.
10. The Peasants' Revolt.

First Year.—Chief Points :—

Richard the First. As Richard was absent from England for a long time, engaged in the Third Crusade, some knowledge of the Crusades is important.
Causes—The persecution of Christian pilgrims in the Holy Land at the hands of the Saracens. The preaching of Peter the Hermit; the support given by the church (the character of the age was suited to such warlike enterprise).
Events—Note the First and Third Crusades in which the English princes took part.
Results—Increased power of church. She bought the estates of the Crusaders cheaply; levied fines on those who took the vow and could not keep it. Increased commerce between east and west, and the rise of Venice to the position of the most important town in Europe. Increased knowledge of geography.
Failed because—(1) The scene of operation was too far from Western Europe in the days of very slow transit; (2) the jealousies, etc., of the various leaders.
Note the condition of England during Richard's absence.
John. The loss of the French provinces.
Quarrel with the Pope; interdict and excommunication. Why did the latter cow John when the former had no effect?
Events leading up to the Magna Charta.
Provisions of the Magna Charta (most important).
Henry the Third (see above).

Second Year.

Charles the Second. Bearing in mind that the execution of Charles the First and the supremacy of intolerant Puritanism were produced by a minority of the people, it is little to be wondered at that at the Restoration there should have been a reaction, and that the suppressed enjoyment should have exhibited itself in striking contrast to the gloom of the preceding years. The "Merrie Monarch" set an example that was all too readily followed by his courtiers, and it was to some extent natural that in the early years there should be some amount of retaliation on the Independents. The exhumation of the bodies of Cromwell, Ireton, and Bradshaw was an act of petty spite; the Clarendon Code of Laws was a more deliberate attempt to punish Nonconformists. The Acts were :—
1661. *Corporation Act*, forcing all municipal officers to take the sacrament according to the rites of the English Church.
1662. *Act of Uniformity*, compelling all ministers to use the Book of Common Prayer and take the oath of non-resistance (2,000 ministers resigned).
1664. *Conventicle Act*, forbidding meetings of more than five persons beyond the ordinary household for religious worship.
1665. *The Five Mile Act*, forbidding excluded ministers from coming within five miles of any borough or place where they had formerly ministered.

The Great Plague and Great Fire are eloquent testimonies to the sanitary conditions of the times. (All students should read some of Pepys' *Diary* for an insight into the proceeding at this date.)
The *foreign policy* of Charles was in great contrast to that of Cromwell. The king retained all the vicious Stuart ideas, and, being too lazy and selfish to openly insist upon them against the will of the people, resorted to underhand intrigue and political dishonesty. Thus in 1668 the Triple Alliance of England, Holland, and Sweden against France was concluded openly by the Government; while in 1670 Charles signed the Secret Treaty of Dover, pledging himself to do everything which the Triple Alliance opposed. He sold his own and his country's honour.
The Dutch War also was a great contrast to the naval warfare under the Commonwealth.
The Titus Oates Plot is an outward sign of the great mistrust of the nation generally against Roman Catholics.
The only bright spot in the legislation is the Habeas Corpus Act, which provided means for putting in execution a general principle which had been included in the Magna Charta.

3. GEOGRAPHY.

Candidates must get up each country in detail. Plenty of sketch-maps must be used.
Second Year.—British possessions in Africa. Enter and learn the following note :—
Total area, 3½ million square miles. Population, 14,000,000. Trade about £80,000,000 annually (three-quarters with the British Isles).
The colonies may be classified thus :—
1. Self-governing colonies.
(*a*) Cape Colony.—Area, 230,000 square miles. Population, 1½ millions.
(*b*) Natal (with Zululand).—Area, 35,000 square miles. Population, 1 million.
2. Crown colonies (that is, colonies governed more or less by the Colonial Office in London through governors appointed therefrom).
(*a*) Transvaal.—Area, 120,000 square miles. Population, 900,000.
(*b*) Orange River Colony.—Area, 48,000 square miles. Population, 210,000.
(These two colonies are as yet under military administration. They will be taken over by the Colonial Office in a few months.)
(*c*) British Central Africa.—Area, 50,000 square miles. Population, 1 million.
(*d*) Bechuanaland.—Area, 50,000 square miles. Population, 75,000.
(*e*) West Coast Settlements (Gambia, Sierra Leone, Gold Coast, Lagos, and Nigeria).
Nigeria is probably described in all but the newest text-books as the Royal Niger Protectorate, ruled by the Niger Company; but the Company gave up its administrative rights to the Crown at the beginning of last year. (See the interesting article page 630.)
(*f*) Islands.—St. Helena and Ascension, Mauritius and Socotra.
3. Protectorates.
(*a*) British East Africa.—Area, 1,200,000 square miles. Population, 6½ millions.
(*b*) Bechuanaland.—Area, 200,000 square miles. Population, 250,000.
(*c*) Basutoland.—Area, 10,000 square miles. Population, 220,000.
(*d*) Rhodesia.—Area, 630,000 square miles. Population, 100,000.
Rhodesia is governed by the British South Africa Company—a Chartered Company—which in return for the monopoly of trading privileges undertakes to develop the country, and make roads, railways, etc.

In dealing with each colony, pay particular attention to productions, industries, imports, exports, chief town, and means of communication.

Test Questions.

1. *English.—Candidates.*
(1.) Analyse verse 8, and parse *let*, *mock*, *grandeur*, *poor*.
(2.) Make a list of the suffixes in the first eight verses, and give the meaning in each case.

First Year.
(1.) Analyse lines 33–40, and parse *deep plunging*, *smooth*, *such*, *care*, *lest*, *overturn*.
(2.) Give in your own words Cowper's description of the woodman.

Second Year.
(1.) Analyse lines 103–110, and parse *free*, *sincere*, *only*, *needs must*, *made passive both*.
(2.) Give a summary of what Milton says about Free Will.
2. *History.—Candidates.*
(1.) Give an account of the Feudal System.

(2.) What circumstance led to the signing of the Magna Charta? Give a summary of its provisions.

First Year.

(1.) Give an account of the state of England in Stephen's time.

(2.) Mention some of the reforms effected by Henry the Second.

Second Year.

(1.) Draw a map of England, and mark in the position of places where important events occurred during the Civil War.

(2.) Say what you can of Cromwell's foreign policy.

3. *Geography.—Candidates.*

(1.) In what places are iron, slate, salt, china clay, and copper found?

(2.) Write a short essay on the exports of England.

First Year.

(1.) What are the chief manufactures of France? State what is made at Rheims, Sedan, Valenciennes, St. Etienne, Lyons, and Grenoble.

(2.) What does the "German Empire" mean? How is it governed?

Second Year.

(1.) Give some account of the people, industries, and trade of the Soudan.

(2.) Say what you can of Egypt under these heads:—(*a*) Government; (*b*) exports; (*c*) any improvement effected during the British occupation; (*d*) railways.

4. *Arithmetic.—Candidates.*

(1.) Find the G.C.M. of 2057, 2448, 5083 by ordinary method and by factors. Ans. 17.

(2.) The L.C.M. of two numbers is 1904, and one of them is 153 more than the other. Find the numbers. Ans. 272; 119.

First Year.

(1.) By selling an article for one guinea I lose 12½ per cent. For what ought I to have sold it to gain 18 per cent.? Ans. $28\frac{8}{9}$s.

(2.) Supposing the annual consumption of beer to amount to 120,450,000 gallons, and the duty per gallon to be 1½d., how would the revenue be affected if the consumption fell off 20 % and the duty was raised 50 %? Ans. £153,895, 16s. 8d. gain.

Second Year.

(1.) What is the difference between the true and banker's discount on £658, 6s. 8d. for 9 months, at 5 % per annum? Ans. 17s. $10\frac{5}{9}$d.

(2.) The interest on a certain sum of money for 2 years is £71, 16s. 7½d., and the discount on the same sum for the same time is £63, 17s., simple interest being reckoned in both cases. Find the rate per cent. per annum, and the sum. Ans. 6¼ %; £574, 13s.

AUTUMN EXAMINATION, 1901.

Eighth Month.

WORK TO BE PREPARED.

1. READING AND RECITATION.

Continued oral practice. Those who are weak in this subject would do well to practise from a specially-prepared book, such as Forsyth's *Practical Elocutionist* (Blackie).

2. ENGLISH.

Candidates.—Marmion, Canto vi., lines 798–901.

First Year.—The Traveller, lines 335–376. Twenty roots and meanings per week, and the derivation of all important words in the passage set.

Second Year.—Julius Cæsar, Act iv., Scene 3, line 121, to end of Act iv.

All pupil teachers should use *The Pupil Teacher's English Notebook*.

3. ESSAYS.

Write one or two essays each week, selecting from the following:—*Our Food Supply; Autumn; The Effects of a Storm; Describe some incident of which you have heard or read* (give as graphic an account as you can); *The Losses of the Blind; The Character of Alfred the Great.*

4. HISTORY.

Candidates.—Charles II., James II., William and Mary.

First Year.—Henry VII.

Second Year.—George III. to 1800.

5. GEOGRAPHY.

Candidates.—Scotland: industries, imports, exports, counties, towns, and government.

First Year.—Arabia, Persia, Asia Minor, Afghanistan.

Second Year.—South America.

6. ARITHMETIC.

Candidates.—Simple proportion.

First Year.—Profit and loss.

Second Year.—Mensuration of rectangular areas.

7. EUCLID.

First Year.—Props. 25 and 26, with four deductions each week.

Second Year.—Revise Props. 13–16, with eight deductions each week.

8. ALGEBRA.

First Year.—Addition and subtraction of fractions involving use of G.C.M. and L.C.M.

Second Year.—Problems on quadratics.

Notes on the Month's Work.

1. COMPOSITION.

I shall be pleased to give a prize to the best specimen essay sent in during the month on either of the subjects set above.

2. HISTORY.

Candidates.—The points which will require most attention in the period set are: (1) the sudden changes in manners, etc., from the gloom of the Puritans to the opposite extreme of frivolity and gaiety under the "Merrie Monarch;" (2) the Clarendon Code, dealing with Dissenters; (3) the Great Fire and Plague; (4) the Dutch War, and (5) the Titus Oates Plot; (6) the Test Act and Habeas Corpus Act. Note also the foreign policy of Charles the Second—subservience to France. In James the Second, the chief interest centres in his attempts to restore Catholicism; Monmouth's Rebellion, and the Bloody Assize; Declaration of Indulgence; Trial of the Seven Bishops, and flight.

In William the Third, note very carefully the Declaration (afterwards *Bill*) of Rights, which settled definitely the questions which had agitated English minds for centuries; the reduction of Ireland and Scotland; the Triennial Bill, Mutiny Bill, Toleration Act. Note how William's Continental connection drew England more and more into the area of European politics, and that the king's foreign policy was directed to breaking the enormous power and influence of Louis the Fourteenth.

The growth of government by party is also important.

First Year.—In Henry the Seventh's reign, which may be said to commence modern history, there are many important features. The downfall of the Feudal System had left the king nearly absolute, and inaugurated a period of rule by mental superiority rather than by physical force. Henry the Seventh was a miser. Note the means of acquiring money: confiscation of Yorkist property, by Star Chamber, by Empson and Dudley and Cardinal Morton's fork, by grants from parliament for war, and grants from France *not* to go to war. Note the plots, and how they failed. The marriages of his children are also important. The marriage of Catherine of Aragon to Prince Henry helped to bring about the Reformation; that of Margaret with James of Scotland resulted in the Stuarts being placed on the English throne.

Prepare answers to the following questions:—

1. Who was Henry the Seventh? By what right did he ascend the throne? Whom did he marry, and in what way was this marriage important?

2. What attempts were made to dethrone Henry the Seventh? How did he deal with these attempts?

3. By what means did Henry the Seventh obtain money?

4. Why should this reign be considered the commencement of modern history?

Second Year.—The finish of the Seven Years' War resulted everywhere in gain for England. In America we acquired Canada; in India the foundation of our empire was firmly laid. The loss of the American colonies must be carefully studied under the following heads:—

1. What were the causes? Selfish commercial policy and unjust taxation—unjust, not because the colonists should not pay something for the great cost of the Seven Years' War, but because the taxes were imposed in an illegal manner.

2. The events.

3. The results—the loss of America, the founding of Australia.

The social condition of the times should be noted: vice and drunkenness everywhere rampant, religion practically dead.

3. GEOGRAPHY.

Use sketch-maps freely. Geography is not known unless a fairly accurate map can be reproduced from memory.

4. ARITHMETIC.

Candidates.—The theory of proportion and ratio must be thoroughly prepared.

Ratio is the relation existing between two quantities of the *same* kind with regard to magnitude. Proportion is the equality of two ratios. There can be no ratio between things of different kinds. Hence to say that, "As 3 books : 4s. 6d. :: 5 books : 7s. 6d.," is wrong. It should be, "As 3 books : 5 books :: 4s. 6d. : 7s. 6d." Look up answers to such questions as: What is direct ratio? Inverse? Compound? Greater inequality? Lesser inequality? Work all sums by the method of unity, because it is far more readily understood by a class.

First Year.—In working problems on profit and loss great care will be needed. As a rule cost price should always be taken as *100*. A set of examples of typical sums will be worked out next month.

Second Year.—Remember that length + breadth = area, and in all cases draw a diagram to illustrate questions. Papering and painting walls of a room

forms a very common subject for a question. Areas of paths, lawns, oblongs, and squares can only, as a rule, be worked out by means of a diagram. If any difficulties are experienced, send up for solution.

Test Questions.

1. *Penmanship.*
   Large Hand:—*Erroneously.*
   Small Hand:—*Ring out wild bells to the wild sky,*
   The flying cloud, the frosty night.
2. *English.—Candidates.*
   Analyse, and parse words in italics:—
   "But if we *conquer*, cruel maid,
   My spoils shall at your feet *be laid*
   When here we meet *again*."
   First Year.
   (1.) Paraphrase lines 297–309.
   (2.) Analyse:—"Thus while around.....
   .....are here displayed."
   (3.) Parse *while, around, hence, opulence, brings.*
   Second Year.
   (1.) Paraphrase:—"You have done that.....
   .....dash him to pieces."
   (2.) Analyse the first six lines of the same piece.
   (3.) Parse:—"A flatterer's would not, though they do appear
   As huge as high Olympus."
3. *Geography.—Candidates.*
   Write a description of the Hebrides, and say something of the people and their occupations.
   First Year.—How is China governed? What European nations have obtained a footing there, and in what places?
   Second Year.—Mention twelve large towns in the United States, and say what is the leading industry connected with each.
4. *History.—Candidates.*
   Explain the causes that led to the Civil War in England. Why were the Stuarts restored?
   First Year.—Write a life of Warwick the King-maker, and explain what part he took in the Wars of the Roses.
   Second Year.—What do you understand by "The Reformation of the Calendar"? Why was it necessary, and what important changes were made?
5. *Music.—Candidates.*
   (1.) What other groups of contiguous scale-tones are separated by the same interval steps as the following:—

   d r m f s ‖ l, t, d r m

   (2.) Name the following intervals:—

   f-l, s-d', r-d', m-t, t-f

   (3.) Write over each note and rest in the following its value in pulses or fractions of a pulse:—

   |m :d.m:s |f :-.m:r |m :- :- |s :-.t,:d ‖

   First Year.
   (1.) Rewrite, making a change to the first flat key at (*a*), and a return to the original key at (*b*):—

   (*a*) (*b*)
   d s m s ta l s f ta l d' t r' d'

   (2.) Write the following intervals:—
   Major third above **ray.**
   Diminished fifth above **me.**
   Perfect fifth above **te,.**
   Minor third above **fe.**
   Major third above **ta.**
   (3.) Rewrite the following in two-pulse measure, halving the value of each note and rest:—

   |s :- |m :d |m :-.r |d :- |f :s.f |m :s |r : - | - : - |

   |l : |s : |f : |m : |s :- |f.m:r |d : - | - : - ‖

   Second Year.
   (1.) Name the intervals formed by each of the following notes with the others:—

   se t d' f'

   (2.) Write out the following in three-pulse measure:—

1½	½	½	¼	1½	½	1	1	1	1	½	¼	¼	2
s	m	d	m	s	l	s	f	rest	m	r	m	r	d

   (3.) Explain the meaning of the following terms:—
   Grazioso, piano, marcato, diminuendo, staccato.

SCHOLARSHIP EXAMINATION, 1901.

Sixth Month.

WORK TO BE PREPARED.

1. *Reading and Repetition.*—Ten minutes' daily practice.
2. *Penmanship.*—Regular practice from *The Practical Teacher Copy Book.*
3. *Theory of Teaching.*—Chap. vi., *Scholarship School Management.*
4. *Geography.*
   (1.) Cape Colony, Natal, Orange River Colony, and the Transvaal.
   (2.) Revise Siberia, Japan, Indo-China, and the East Indian Archipelago.
5. *English.*
   (1.) Grammar and syntax of the preposition and conjunction.
   (2.) Twenty-five roots and meanings each week.
   (3.) Literature from 1600 to 1700.
   (4.) *Julius Cæsar*, Act iii., Scene 2.
6. *History.*—James I. to the Restoration.
7. *Composition.*—One or two essays each week, on such subjects as:—The Budget; Migration of Birds and Animals; Popular Superstitions; The Maories; Elizabethan Literature; Vegetarianism; "Sweet are the uses of adversity."
8. *Arithmetic.*—Averages, percentages, commission, brokerage, profit and loss.
9. *Algebra.*—Problems on quadratics.
10. *Euclid.*—Revise Book I., Props. 11–20, and ten deductions per week.
11. *Elementary Science.*—Terrestrial magnetism. Properties of the loadstone and artificial magnets. The earth a magnet. Primary laws of magnetic attraction and repulsion. Dip. The earth's magnetic poles.
12. *Languages.*
    Latin—Pars. vii. and viii. of *Life of Epaminondas.*
    French—Four chapters from *Le Roi des Montagnes.*
13. *Drawing.*—A freehand copy each week.
14. *Music.*—Chap. vi., *School Music Teacher.*
15. *Domestic Economy.*—The cost and purchase of clothing. Materials used, and their source.

Notes on the Work for the Month.

1. *Geography.*—British South Africa requires very careful preparation in view of the attention which has been called to it recently. The student should, before commencing the geography, read up the history in *The Expansion of the British Empire* (A. M. Holden). A knowledge of the history is the only key to recent events. Note that "Cape Colony," the self-governing colony, comprises Cape Colony proper (extending to the river Kei), Transkei, Griqualand East and West, Tembuland, and Walfisch Bay, the only good harbour in German West Africa.

Natal, another self-governing colony, has under its administration Zululand.

Basutoland is a Crown Colony under the rule of a Resident Commissioner, responsible to the High Commissioner for South Africa.

The Orange River Colony and the Transvaal are at present largely under military administration, but in a few months they will undoubtedly become Crown colonies, and be administered by a governor and a council chosen by the Crown. As soon as the behaviour of the people warrants it, representatives will be elected, and doubtless in a few years the two colonies will be granted a substantial amount of, if not entire, self-government. The next step, then, will probably be the federation of the whole of South Africa, somewhat on the lines of the Australian Commonwealth.

Make special points of the productions (especially minerals), industries, towns, railways, lines of steamers, and the time of transit.

Prepare answers, if necessary, to the following questions:—

(1.) What do you know of the climate and productions of British South Africa?

(2.) State as concisely as you can the boundaries of Cape Colony proper, and compare the colony—in (*a*) size, (*b*) climate, (*c*) population—with Great Britain.

(3.) How is Cape Colony governed? Is it well suited for agriculture? What minerals are found in the colony? Describe its climate.

(4.) Compare the physical features of South Africa with those of Australia.

(5.) A great hindrance to progress in Africa is the difficulty of enlarging production. Show as carefully as you can how the difficulty is being removed.

(6.) Describe a journey from Cape Town to Buluwayo.

2. *English.*—The classification of the conjunction—(*a*) according to meaning, (*b*) according to function—must be learnt. A common question is that on the points of similarity and dissimilarity of conjunctions and prepositions.

Points to be noticed:—

(1.) A preposition may govern an adverb—for example, They came *from* far and near.

(2.) A preposition may govern an adverbial phrase—for example, The king *from* on high.

(3.) *Beside* and *besides* have different meanings. The former has reference to *place*, the latter means *in addition to.*

(4.) Many words originally participles are now considered prepositions—for example, concerning, during, excepting, notwithstanding.

(5.) The preposition *at* or *on* is often met with in colloquial talk as *a*—for example, I go a-fishing, I am a-coming, etc. In this case it governs a verbal noun.

(6.) *Than* is a conjunction; hence it is incorrect to say, "He is taller than me." The full meaning is, "He is taller than I am tall."

3. *History.*—Prepare answers to the following questions, which indicate the general line taken by examiners:—

(1.) What were the points of difference—(*a*) between Charles the First and his Parliament, (*b*) between Cromwell and Parliament? Give reasons to account for the facts—(*a*) that Cromwell was able to maintain his power, (*b*) that the Protectorate could not be maintained after his death.

(2.) Say what you can of the relations with Scotland during the reign of Charles the First.

(3.) Say what you can of the Long Parliament.

(4.) Explain as well as you can the differences between Presbyterians and Independents about religion and politics before, during, and after the war.

(5.) Say as carefully as you can what you know about the character and political principles of Strafford and Cromwell.

(6.) Give the personal character of James the First, and contrast it with those of Charles the First and Charles the Second.

(7.) What do you know of the Duke of Buckingham (in reigns of James the First and Charles the First), Sir John Eliot, Laud, Prynne, Fairfax, Montrose?

(8.) What events connected with the Civil War took place at Nottingham, Oxford, Taunton, Bristol, York, Newcastle, Dunbar, Worcester?

(9.) Explain the terms National Covenant, Solemn League and Covenant, New Model, Self-Denying Ordinance, Delinquent, Commonwealth, Independent.

(10.) What were the chief changes in manners and society that accompanied the growth of Puritanism in England?

4. *Arithmetic.*—Percentages and profit and loss require careful study. They are dealt with exhaustively in the text-book, and an excellent collection of samples given.

Test Questions.

1. *Penmanship.*

(1.) Large Hand—*Cytherea.*

(2.) Small Hand—*It was not by vile loitering in ease*
That Greece obtained the brighter palm of art.

2. Write a letter pointing out in what way this course may be made of greater use to students.

(I shall be pleased to give a prize for the best suggestions submitted.)

3. Make a list of the commonest errors to which teachers are liable in teaching arithmetic to very young children.

4. What preparation have you been taught to use before letting children attempt to work sums in weights and measures?

5. Give as full an account as you can of Natal, and draw a sketch-map.

6. Into what classes would you divide conjunctions? With what other parts of speech would you connect and contrast them?

7. Analyse the following, and parse words in italics:—

"I speak not *to disprove* what Brutus spoke,
But here I am to speak *what* I do know.
You all did love him *once*, not without cause;
What cause withholds you then *to mourn* for him?
O judgment, thou art fled to brutish beasts,
And men have lost their reason! Bear with me:
My heart is in the coffin there with Cæsar,
And I *must* pause *till* it come back to me."

8. Give an account, and show the political bearing, of the plots against James the First.

9. Discuss the advantages of preparing meat by stewing, and say what portions of beef and mutton are best so treated.

10. Compare the advantages of linen, cotton, and woollen clothing with regard to durability, health, and economy.

CORRESPONDENCE: RULES.

To ensure an answer in the next issue, queries must be sent by the 15th of each month.

Name and address of sender, with coupon of current number of THE PRACTICAL TEACHER (and *nom de plume* if desired), must be enclosed.

As a rule, all replies will appear in the Correspondence Column; but any one desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to "Mr. A. T. FLUX, The Bays, Belvedere, Kent."

ANSWERS TO CORRESPONDENTS.

In Doubt.—If you sit and fail twice, you may not sit again; but if you pass, you may sit as many times as you like. Judging from what you write, I should say you would do well to defer your first attempt. Send up specimens of your work, and I can advise you further.

(*Other Correspondents answered by post.*)

OUR CERTIFICATE COURSE FOR 1901.

BY GEORGE COLLAR, B.A., B.SC.,

Head-Master of the Stockwell Pupil Teachers' School.

WE have now to deal with Johnson's *Life of Milton*, and we shall then have treated of all the special work set for the 1901 examination, which will be upon us in another month. We must, therefore, press upon our readers the necessity for thorough revision in all subjects. We cannot hope to have cleared up all the difficulties that the course presents, as that would require far more space than is available; but we have taken the most important points, and dealt with those matters which are not generally presented in the best light in the text-books. If our readers will kindly send up any difficulties we have been obliged to pass over, we shall be glad to send solutions, if stamped directed envelopes are enclosed.

We also give this month a set of papers which should be worked under the same conditions of time, etc., as the actual Certificate papers. No book should be consulted, after the questions have been seen, until the answers have been written out. Text-books and the back numbers of THE PRACTICAL TEACHER should then be used in correcting them, and in strengthening up the weak points they may reveal.

ENGLISH LITERATURE (FIRST YEAR).

Johnson's "Life of Milton."—The student finds that Johnson's opinion of Milton differs widely from that of Macaulay. The truth will probably be obtained by putting the two together and "averaging" their statements.

The two critics belong to totally different schools of thought: Johnson was a strong Tory, and his own trials had made him pessimistic, so that he was always ready to see the dark side of things; Macaulay was a strong Liberal, and studied Milton when his works had been accepted as classical.

The following quotations should be committed to memory, as showing a prejudice against Milton:—

"He.....seems to commend the earliness of his own proficiency to the notice of posterity. But the products of his vernal fertility have been surpassed by many."

"At fifteen, *a date which he uses till he is sixteen*, he translated or versified two psalms."

(Why find fault with Milton for calling himself fifteen until his sixteenth birthday? Surely it is the universal plan to write "age last birthday.")

"It appears, in all his writings, that he had the usual concomitant of great abilities—a lofty and steady confidence in himself, perhaps not without some contempt of others."

"Milton, having tasted the honey of public employment, would not return to hunger and philosophy, but, continuing to exercise his office under a manifest usurpation, betrayed to his power that liberty which he had defended."

"He hated all whom he was required to obey."

Other characteristic comments should also be remembered, as—"They" (that is, *L'Allegro* and *Il Penseroso*) "are two noble efforts of imagination."

"None ever wished it" (*Paradise Lost*) "longer than it is. Its perusal is a duty rather than a pleasure. We read Milton for instruction; retire harassed and overburdened, and look elsewhere for recreation: we desert our master, and seek for companions."

Notice Johnson's digression for the purpose of giving his own views of what constituted a liberal curriculum. The chief facts of Milton's life are fully and carefully set out by Johnson, and the student should remember them. It is hardly worth while to trouble about what became of his descendants.

Johnson's remarks on *Lycidas* are very harsh. If his arguments are carried to their logical conclusion, all allegory and metaphors must be condemned. We must remember, also, that a poem is not a mere spontaneous expression of the writer's feelings; it is a polished work of art: and although the time required to put on the polish may also modify the writer's feelings, Johnson goes too far when he says, "Where there is leisure for fiction there is little grief." We can hardly think that the figures employed in *Lycidas* lay the writer open to the charge of insincerity. The attack on the bishops is more to be regretted; but we must remember that Milton lived in a period of keen controversy.

Johnson warmly admires the two pieces *L'Allegro* and *Il Penseroso*, which the student should read through in order to

see the force of Johnson's criticism. With regard to *Comus*, it should be noticed that Johnson praises the poetry of it, but condemns it on the point of dramatic arrangement.

Johnson's opinion of the sonnets—"For the best of them it can only be said that they are not bad"—should be contrasted with Macaulay's: "They are simple but majestic records of the feelings of the poet."

Johnson introduces his remarks on *Paradise Lost* with a very fine paragraph on the nature and purpose of poetry, particularly epic poetry. This paragraph—"By the general consent of critics.....metrical modulation"—is well worth committing to memory.

Among the notes on the *characters*, observe what is said of Satan: "To make Satan speak as a rebel, without any such expression as might taint the reader's imagination, was indeed one of the great difficulties of Milton's undertaking; and I cannot but think he has extricated himself with great happiness."

Note also the special praise accorded to Milton for the morality of the poem: "In Milton every line breathes sanctity of thought and purity of manners."

Note the character of Adam and Eve: "Venerable before their fall for dignity and innocence, and amiable after it for repentance and submission. In the first state their affection is tender without weakness, and their piety sublime without presumption."

An important objection to Milton's work is that the rebel angels are sometimes material and sometimes immaterial beings. The personification of Sin and Death is condemned as being carried too far.

Paradise Regained is shortly criticised: "It is in many parts elegant, and everywhere instructive."

Milton is blamed for imitating the ancient tragedies, and for the general structure of *Samson Agonistes*, in spite of its having "many peculiar beauties, many just sentiments and striking lines."

Milton "was desirous to use English words with a foreign idiom," and although this objection makes itself felt in the prose writings, it seems to add majesty to the poems.

TEST PAPERS.

English Composition (Both Years).

(One hour allowed.)

Write in plain prose a short essay on one of the following subjects:—

(*a*) The Force of Example.
(*b*) Habit.
(*c*) The Love of Literature.

Theory of Teaching.

Men and Women (Second Year).

(Three hours allowed. Answer seven questions.)

1. Write notes of a lesson on one of the following:—
   (*a*) A Tea-kettle (for infants).
   (*b*) Mary Queen of Scots.
   (*c*) The West Indian Islands.
   (*d*) Compound Interest.
   (*e*) Solution of Solids.
2. What are the objects of teaching English grammar in schools? Mention some of the common faults in teaching this subject.
3. How would you teach children such a poem as *Casabianca?*
4. Describe the method of keeping the admission register and the log-book.
5. How does memory differ from imagination? Say what steps you would take to cultivate your children's memory.
6. Explain clearly what is meant by "intuition," "judgment," "conception," and "apperception."
7. What do you mean by the "extension" and the "intension" of a term? Arrange the following in order of their extension:—Londoner, Briton, animal, Englishman, mammal.
8. Illustrate, by means of examples, the difference between perfect and imperfect induction.
9. What are the chief causes of unpunctuality among school children? If, on first taking charge of a school, you found widespread unpunctuality, how would you endeavour to remedy it?
10. What does Plato include under the term "music"? How does he enforce the need of teaching it, and with what limitations?
11. Give instances of recommendations from Locke's *Thoughts* which are applicable in dealing with a private pupil, but not in dealing with a class.
12. Give a summary of Froebel's remarks on the study of nature.

Geography (Both Years).

(Two and a half hours allowed. Answer seven questions, and illustrate them when you can by sketch-maps.)

1. Where are the following places, and for what historical events are they noted:—Camperdown, Toulon, Quiberon Bay, Rivoli, Valmy, Jena, Austerlitz, and La Vendée?
2. Of what did the Austrian dominions consist in 1789?
3. Over which parts of Europe is the authority of the Sultan of Turkey acknowledged? How have his dominions varied in the last hundred years?
4. Describe the course of the Danube, and say a few words about the chief towns on its banks.
5. Give a short account of the physical features of the Scandinavian peninsula.
6. Give an account of the European possessions of Great Britain, excluding the British Isles.
7. Write an account of the agriculture of France, *or* of the manufactures of Belgium.
8. Describe the chief trade routes which cross the Alps.
9. What are the most important fisheries of Europe?
10. From which countries of Europe do we import eggs, butter, poultry, wheat, copper ore, silk goods? How do these commodities respectively reach us?
11. Name some of the most strongly fortified towns in Europe; give their positions, and the special reasons for fortifying them.
12. In which parts of Europe are there canals navigable for ships?

History (Both Years).

(Answer seven questions. Two hours and a half allowed.)

1. Write an account of Pitt's foreign policy.
2. Trace the course of the French Revolution up to the death of Louis the Sixteenth.
3. Which statesmen in England at first favoured the French Revolution? Describe the events that led immediately to the outbreak of hostilities between England and France.
4. Describe the position of the British power in India during the revolutionary period.
5. Give an account of the Treaty of Amiens, and say why some of its clauses were never fully carried out.
6. Narrate the events leading up to the battle of Trafalgar, and show the importance of that victory.
7. What were the "Berlin Decrees"? How did Napoleon endeavour to enforce them, and what were the results of his policy?
8. It has been said that other nations have gained more from the French Revolution than France itself. In what ways is this remark true?
9. Give an account of Napoleon's campaign in Russia, dealing particularly with its causes and effects.
10. What attacks, direct or indirect, were made upon British possessions during the revolutionary wars?
11. Give an outline of the Peninsular War.
12. Write a short account of the "Hundred Days" and the Waterloo campaign.

Arithmetic.

Men (First Year) and Women (Both Years).

(Two and a half hours allowed. Answer Question 1 and nine others.)

1. Answer three of the following:—
   (*a*) State and prove the rule for division of decimals.
   (*b*) Explain, as to a class, the method of obtaining the product of 3·4571638 and ·0486257 correct to four places of decimals.
   (*c*) In what way are the metric units of volume, weight, and coinage related to the metre?
   (*d*) Give two numbers which are relatively prime, but not absolutely prime; and show that if two numbers are absolutely prime, the G.C.M. of their sum and difference may be 2, but cannot be anything greater.
2. The distance from London to York is 150 miles. Trains start from London and York respectively at 10 o'clock, and meet at 11.50. If the distance one travels in an hour is $\frac{7}{8}$ of the distance the other travels in 45 minutes, find how far each will have run before they meet.
3. Divide £3, 18s. 4d. among A, B, and C so that B may receive $\frac{3}{4}$ as much as A, and C receive 5s. more than B.
4. Multiply $1 - \frac{\frac{1}{16}}{(\frac{1}{2} + \frac{1}{4})^2}$ by $1 - \frac{\frac{1}{16}}{\frac{1}{4} - \frac{1}{16} + \frac{1}{256}}$.

5. Extract the square root of 0·51 to four places of decimals, and thence obtain the next three digits by division.

6. A room is 13 feet long, 12 feet wide, and 11 feet high. What length of paper a yard wide would be required to cover its walls and ceiling?

7. A shopkeeper marks his goods with a price from which he can deduct 7½ per cent. and still make a profit of 10 per cent. on what the goods cost him. Find the cost price of an article which he marks at £2, 15s.

8. A man invests a fourth of his capital in 2¾ per cent. stock at 90, and the remainder in 3½ per cent. stock at 105. Find the average rate per cent. return on his capital.

9. If either 5 men or 9 boys can do a certain piece of work in 19 days, in how many days can 13 men and 7 boys, working together, do a piece of work twice as great?

10. A plot of land contains 300 acres, and is in the form of a rectangle, having its length three times its breadth. Find, to the nearest yard, the length of fence required to enclose it.

11. A man realised £2730 by selling a 3 per cent. stock at 113¾, and invested one-third of this sum in a 4 per cent. stock at 130, and the remainder in a 2¾ per cent. stock at 110⅝. Find how much of each stock he bought, and the difference it made in his income.

12. Coal at 32s. a ton is mixed with coke at 24s. a ton in the proportion of 5 tons of coal to 3 tons of coke. Find the money saved by using 11 tons of the mixture instead of 12 tons of coal.

English Grammar and Literature.

Men and Women (First Year).

(Three hours allowed. Answer two questions in each section.)

I.

1. Explain what is meant by *doublets*, *hybrid words*, *roots*, *derivatives*, and *inflections*. Give examples of each.

2. Write notes of a lesson on Tense.

3. In what ways have words of Italian and of Dutch origin been introduced into the English language?

II.

1. Give a sketch of Johnson's criticisms on *L'Allegro* and *Il Penseroso*.

2. What dramatic works did Milton produce, and what criticisms did Macaulay and Johnson make on them?

3. Contrast Macaulay's views of Milton's political conduct with those of Johnson.

III.

1. Write a short account of the "sea-poetry" of England as illustrated in the *Lyra Heroica*, and give a fuller account of one of the pieces.

2. Name some American writers whose works are represented in the *Lyra*, and give an account of the life and works of one of them.

3. Explain and give the context of the following:—

(*a*) "Who died as firm as Sparta's king,
Because his soul was great."

(*b*) "With oaken brace and copper band
Lay the rudder on the sand."

(*c*) "Astur hath stormed Janiculum,
And the stout guards are slain."

(*d*) "Now Howard may get to his Flaccus."

(*e*) "Fall into the hands of God,
Not into the hands of Spain."

(*f*) "It was ten of April morn by the chime."

(*g*) "None but the brave deserve the fair."

Men and Women (Second Year).

(Three hours allowed for this paper. Answer two questions in each section.)

I.

1. Explain:—Linstock, point of fox, buxom, nookshotten, rivage, sternage, pix, tike, curtal axe, hilding.

2. Sketch the character of the hero of *Henry V.*, and say what contrasts Shakespeare brings in for the purpose of setting it off.

3. What historical events are referred to in the play, and in what way does Shakespeare modify history for the purposes of the drama?

II.

1. Give your opinions on the style, metre, and language of *Paradise Lost*, and illustrate your remarks by quotations.

2. Give examples of classical forms and idioms employed by Milton.

3. Explain:—

(*a*) "At last his sail-broad vans
He spreads for flight."

(*b*) "We are at worst
On this side nothing."

(*c*) "Titan, heaven's first-born,
With his enormous brood."

(*d*) "A boggy Syrtis, neither sea
Nor good dry land."

(*e*) "The rebel king
Doubled that sin in Bethel and in Dan,
Likening his Maker to the grazèd ox.'

III.

1. What traits of Macaulay's personal character most impress you on reading his *Life and Letters*?

2. Write a description of *The Lotos-Eaters*, or of *Ulysses*.

3. Write in your own words an account of *The Passing of Arthur*.

4. To what ancient authorities are we indebted for the Arthurian legends? To what modern books would you refer for information about them? What modern poets have chosen subjects from them?

Algebra and Mensuration.

(Three hours allowed. Answer nine questions. Second Year women taking Algebra as a substitute for Arithmetic should choose all the nine from the Algebra section: First Year men must answer one from the Mensuration section.)

1. Resolve into factors

$5x^2 - 13xy - 6y^2$, $x^3 + 5ax - x - 5a$, $x^4 + x^2y^2 + y^4$,

and show that

$$(a-b)^3 + (b-c)^3 + (c-a)^3 = 3(a-b)(b-c)(c-a).$$

2. If m and n be positive integers, prove that $a^m \times a^n = a^{m+n}$.

Multiply $(x+y)^{\frac{3}{5}} + (x^2-y^2)^{\frac{1}{5}} + (x-y)^{\frac{3}{5}}$ by $(x+y)^{\frac{1}{5}} - (x-y)^{\frac{1}{5}}$, and find the square root of

$$a^{\frac{3}{5}} - 4a^{\frac{4}{5}} + 4a + 2a^{\frac{7}{5}} - 4a^{\frac{8}{5}} + a^{\frac{9}{5}}.$$

3. If a and b are the roots of the equation $x^2 - px + q = 0$, then $a + b = p$, and $ab = q$. Hence show that if the two equations, $x^2 - mx + n = 0$, and $x^2 - px + q = 0$, have a common root, it must be $\dfrac{n-q}{m-p}$.

4. The third proportional to two quantities is a; the mean proportional between them is b. Find the quantities.

5. In a country, a men, b women, and c children live in x houses. What is the average number of people in a house? If $\frac{2}{3}$ of the adult population are married, how many unmarried men are there?

6. Having given the sum S, the first term a, and the common difference b, of a series in A.P., find the number of terms.

7. Simplify—

(i) $\left\{1 - \dfrac{1-x}{1+x} + \dfrac{1-2x^2}{1-x^2}\right\} \left\{\dfrac{x+1}{2x+1}\right\}$.

(ii) $\left\{\dfrac{a^2+ab+b^2}{a^2-ab+b^2} - \dfrac{a^2-ab+b^2}{a^2+ab+b^2}\right\} \div \dfrac{4ab(a^4-b^4)}{a^6-b^6}$.

8. If 10 yards of cheap calico cost 6d. more than 12 yards of a better sort, and 2 yards more of the former than of the latter are bought for 3 shillings, find the price of each sort.

9. Solve the equations

$$ax + by + cz = 1,\ bx + cy + az = 0,\ cx + ay + bz = 0,$$

and prove that

$$\frac{x^2 - yz}{a} = \frac{y^2 - zx}{b} = \frac{z^2 - xy}{c} = x^3 + y^3 + z^3 - 3xyz.$$

10. Show how the square root of $a + \sqrt{b}$ may be found. Find the square root of $69 - 28\sqrt{5}$.

11. Solve the equations—

(*a*) $\begin{cases} \dfrac{5x-8y}{21} - \dfrac{3x-2y}{28} = 1. \\ x - \dfrac{5x-2y}{8} = 4. \end{cases}$

(*b*) $\dfrac{1}{3x-6} + \dfrac{7x}{72(x+2)} - \dfrac{5}{x^2-4} = 0.$

(*c*) $\begin{cases} (x+1)(y+1) = 60. \\ xy = 45. \end{cases}$

12. Show that $\frac{x^2-4}{x^2+2x-3}$ continually increases as x increases from 1 up to $+\infty$.

MENSURATION.

1. The area of a rhombus is 354144 square feet, and one diagonal is 672 feet. Find the other diagonal. Find also the length of a side and the height of the rhombus.

2. The area of a sector is 150 square feet; the angle of the sector is 50°. Find the radius.

MEN (SECOND YEAR).

(Three hours allowed. Answer seven questions in Algebra and one in Mensuration.)

1. Find the value of $\frac{5x^2+41x+1}{3x^2+41x+3}$ in the form $a+m\sqrt{b}$, when x is equal to $-10+\sqrt{61}$.

2. Find the quadratic equation (or equations) which have the sum of the squares of the roots equal to -24, and the sum of the reciprocals of the roots equal to $\frac{1}{4}$.

3. Insert two arithmetical means between m and n, and prove that the product of these means is greater than mn.

4. Find, from first principles, the number of permutations of n different things taken r at a time.

Find (*a*) how many whole numbers, (*b*) how many decimals, can be formed of four digits, two of which are zeros.

5. What is meant by "the logarithm of a number to a given base"? Show that $\log_a \frac{m}{n} = \log_a m - \log_a n$. Given $\log 2 = 3010300$, and $\log 7 = 8450980$, find $\log \sqrt[3]{35}$.

6. Define ratio. Does it follow from your definition that it would be wrong to speak of the ratio of 5 tons to 3 miles, and, if so, how does it follow?

For what values of x will the ratio of x^2-7x+2 to $x^2-8x+10$ be equal to the ratio of 2 to 3? Verify your results by substitution.

7. Find every value of x which satisfies the equation

$$x^4 - 13x^2 + 36 = 0,$$

and find every value of x, with the corresponding value of y, which satisfies the equations $x^2 - y = 2$, $y^2 - x = 2$.

8. In how many ways can a council of 7 members be chosen out of 11 candidates?

In how many ways could the council be chosen so as to contain two assigned candidates?

9. Find, by the binomial theorem, the first five terms of the expansion of $(1+x+x^2+x^3)^n$.

10. Under what conditions will the sum of any two terms in an A.P., or the product of any two terms in a G.P., be found in their respective series, or in the series produced?

EUCLID.

WOMEN (FIRST YEAR).

(Three hours allowed. Answer four questions out of each section.)

I.

1. Prop. 24. 2. Prop. 32. 3. Prop. 16. 4. Prop. 45. 5. Prop. 48. 6. Prop. 29.

II.

1. Show how to construct a triangle, having given the base, a line equal to the difference of the other sides, and the angle at the base opposite the greater side.

2. ABCD is a figure with four equal sides. Show that the diagonals bisect each other.

3. ABCD is a parallelogram, and the side BC is produced to E so that CE = BC. If AE is drawn to cut CD in F, show that F is the middle point of CD and also of AE.

4. From the angular points of a parallelogram straight lines are drawn to a point within the parallelogram. Show that the sum of their lengths is less than the sum of the lengths of the sides of the parallelogram.

5. Through a given point O draw a straight line terminated by two given straight lines, so as to be bisected at O.

6. The angles at B and D respectively of the triangles ABC, ADC, on the same base AC, are right angles. Prove that if BD be joined by a straight line which is produced to meet AC in X, then X cannot lie between A and C.

WOMEN (SECOND YEAR).

(Three hours allowed. Answer four questions in each section.)

I.—*Propositions.*

1. I. 34. 2. I. 47. 3. II. 5. 4. II. 9. 5. II. 11. 6. II. 14.

II.—*Deductions.*

1. Show how to construct an isosceles triangle whose vertical angle is four times each of the angles at the base.

2. Bisect a quadrilateral by a straight line drawn through one of its angles.

3. Let D be a point in the side AB of a triangle ABC. Show how to draw a line through D to cut AC in E, and BC produced in F, so that the triangles ADE, CEF may be equal.

4. A straight line AB is bisected in C. Show how to find a point D in AB produced such that the rectangle contained by AD, DB may be equal to the square on BC.

5. If a straight line be divided into two parts, show that the nearer the point of division is to the middle of the line the greater will the rectangle under the parts be.

6. Prove that the sum of the squares on the diagonals of a parallelogram is equal to the squares on the sides.

MEN (FIRST YEAR).

(Three hours allowed. Answer four questions from each section.)

I.—*Propositions.*

1. II. 12. 2. III. 14. 3. III. 17. 4. III. 21. 5. III. 31. 6. III. 32.

II.—*Deductions.*

1. If one of two circles lies wholly within the other, find the point on the outer circumference from which the two longest tangents can be drawn to the inner circle.

2. Through a given point on the circumference of a circle draw a chord which shall divide the circle into two segments such that the angle in the one segment shall be five times the angle in the other segment.

3. If two circles cut each other, show that the line joining their centres (produced if necessary) is at right angles to the common chord and bisects it.

4. A, B, C are three given points. Construct a square such that the diagonals shall intersect at A, and two adjacent sides shall pass through B and C.

5. Given the base and vertical angle of a triangle, show that if a straight line be drawn dividing the vertical angle into given parts, it will pass through a fixed point.

6. AB and CD are any two chords of a circle, intersecting in E. Show that the triangles EAC, EDB are equiangular.

MEN (SECOND YEAR).

(Three hours allowed. Answer four questions in each section.)

I.—*Propositions.*

1. III. 34. 2. IV. 10. 3. IV. 11. 4. VI. 4. 5. VI. 13. 6. VI. 18.

II.—*Deductions.*

1. Given two fixed points A and B, find the locus of a point P which moves in such a way that the squares on AP and BP are together equal to a given square.

2. If O be the point of intersection of the lines drawn from the angular points of a triangle ABC to the middle points of the opposite sides, show that $AB^2 + AC^2 = 4OA^2 + OB^2 + OC^2$.

3. A and B are two fixed points on the circumference of a given circle; any other point P is taken on the circumference, and AP is produced to Q, so that PQ equals PB. Show how to construct the arcs, on one or other of which Q lies for all positions of P.

4. Given a triangle ABC, show how to describe circles with centres A, B, C so that the circles, with centres B and C, may touch each other externally, and also touch internally the circle whose centre is A.

5. P is a given point in AC, a side of the triangle ABC. Show how to draw through P a straight line to cut AB in Q, and BC in R, so that the triangles APQ and CPR may have equal areas. AB or CB may be produced if necessary.

6. Show that the mean proportional between two lines is less than half their sum.

N.B. Important to First Year Candidates.—***There will be no first year examination in 1902, but in order to enter for the second year's examination in that year, it will be necessary to have previously passed the first year's examination. Some of our first year readers have been led to think that they might omit the examination for which they have been preparing this year. If they do so they will not be eligible for second year's papers next year. This is made clear by the circular (No. 451) recently issued by the Board of Education.***

LONDON MATRICULATION.

JUNE 1901.

BY R. C. B. KERIN, B.A. (LOND.),
First in First-Class Classical Honours at Final;
Principal, Carlyon College, 55 Chancery Lane, W.C.,
AND
E. J. SCHWARTZ, M.A., B.SC.

LATIN COURSE FOR JUNE.

Catilina.—Below will be found some of the most important passages in the *Catilina*. Each passage contains (*a*) either a historical allusion, (*b*) a grammatical difficulty, or (*c*) some important or unusual word or phrase:—

Prius quam incipias consulto et ubi *consulueris* mature facto opus est.—Quibus profecto contra naturam corpus voluptati, anima oneri fuit.—Aliquo negotio intentus praeclari facinoris.—Ubi de magna virtute atque gloria bonorum memores.—Ac me cum ab reliquorum malis moribus dissentirem, nihilo minus honoris cupido eadem qua ceteros fama atque invidia vexabat.—Pauca prius explananda sunt, quam initium narrandi faciam.—Simulator ac dissimulator.—Satis eloquentiae, sapientiae parum.—Neque id quibus modis adsequeretur, dum sibi regnum pararet, quicquam pensi habebat.—Animus ferox inopia rei familiaris et conscientia scelerum, quae utraque eis artibus auxerat.—Incitabant praeterea conrupti civitatis mores, quos pessuma ac divorsa inter se mala, luxuria atque avaritia, vexabant.—Ubi regium imperium, quod initio conservandae libertatis atque augendae rei publicae fuerat.—Inmutato more annua imperia binosque imperatores sibi fecere.—Adepta libertate.—Simul ac belli patiens erat.—Se quisque hostem ferire, murum ascendere, conspici, dum tale facinus faceret, properabat.—Quia provenere ibi scriptorum magna ingenia, per terrarum orbem Atheniensium facta pro maxumis celebrantur.—In suppliciis deorum.—Ubi pax evenerat aequitate seque remque publicam curabant.—Eis otium divitiae, optanda alias, oneri miseriaeque fuere.—L. Sulla armis recepta re publica.—Quo sibi fidum faceret, contra morem maiorum luxuriose nimisque liberaliter habuerat.—Nihil reliqui victis fecere.—Quippe secundae res sapientium animos fatigant, ne illi conruptis moribus victoriae temperarent.—Paupertas probro haberi.—Duci coepit.—Rapere, consumere, sua parvi pendere, aliena cupere, pudorem pudicitiam, divina atque humana promiscua, nihil pensi neque moderati habere.—Pretium est.—Proinde quasi iniuriam facere id demum esset imperio uti.—Quibus mihi videntur ludibrio fuisse divitiae.—Haud facile lubidinibus carebat.—Aes grande conflaverat, quo flagitium aut facinus redimeret.—Dum illos obnoxios fidosque sibi faceret.—Privignum.—Si causa peccandi in praesens minus subpetebat, nihilo minus insontis sicuti sontis circumvenire, iugulare.—Opprimundae rei publicae consilium cepit.—Fuere item ea tempestate qui crederent.—Designati consules legibus ambitus interrogati poenas dederant.—Pecuniarum repetundarum reus prohibitus erat consulatum petere, quod intra legitumos dies profiteri nequiverit.—Eo die post conditam urbem Romam pessumum facinus patratum foret.—Quaestor pro praetore.—Perpessos.—Neque ego per ignaviam aut vana ingenia incerta pro certis captarem.—In dies.—Nisi nosmet ipsi vindicamus in libertatem.—Nam postquam res publica in paucorum potentium ius atque dicionem concessit, semper illis reges tetrarchae vectigales esse, populi nationes stipendia pendere; ceteri omnes, strenui boni nobiles atque ignobiles, volgus fuimus sine gratia, sine auctoritate, eis obnoxii, quibus, si res publica valeret, formidini essemus.—Ubi alienae superbiae ludibrio fueris.—Pro deum atque hominum fidem.—Illis divitias superare, quas profundant in extruendo mari.—Toreumata.—Omnibus modis pecuniam trahunt vexant.—Quin igitur expergiscimini.—Polliceri tabulas novas.—Petitionem suam curae haberent.—Popularis sceleris sui.—Quo inter se fidi magis forent, alius alii tanti facinoris conscii.—Suamet.—Quicquam pensi habebat.—Maria montisque polliceri.—Sublato auctore.—Sumptam mutuam.—Verum ingenium eius haud absurdum.—Petitio.—Intempesta nocte.—Ianua prohibiti.—Senatus decrevit, darent operam consules nequid res publica detrimenti caperet.—Senati decreto.—Impediti ne triumpharent calumnia paucorum.—Sestertia centum.—Ex summa laetitia atque lascivia, quae diuturna quies pepererat, repente omnis tristitia invasit.—Dissimulandi causa aut sui expurgandi, sicut iurgio lacessitus foret, in senatum venit.—Luculentam.—Perdita re publica opus esse.—Inquilinus civis urbis Romae.—Neque insidiae consuli procedebant.—Multa antecapere, quae bello usui forent, nocte intempesta.—Ceterisque, quorum cognoverat promptam audaciam, mandat quibus rebus possent opes factionis confirment, insidias consuli maturent.—Prope diem.—Nos arma neque contra patriam cepisse neque quo periculum aliis faceremus.—Feneratorum.—Fortunis expertes sumus.—Saepe maiores vostrum miseriti plebis Romanae decretis suis inopiae eius opitulati sunt.—Aeris alieni.—Ipsa plebes aut dominandi studio permota aut superbia magistratuum armata a patribus secessit.—Respondit, siquid ab senatu petere vellent, ab armis discedant.—Quam mediusfidius veram licet cognoscas.—Causam pro mea consuetudine suscepi, non quin aes alienum meis nominibus expossessionibus solvere possem,—et alienis nominibus liberalitas Orestillae suis filiaeque copiis persolveret,—sed quod non dignos homines honore honestatos videbam.—Haveto.—Fraude.—Cicero urbi praesidio sit.—Remque publicam opstinatis animis perditum irent.—Neque solum illis aliena mens erat, qui conscii coniurationis fuerant.—Id adeo.—Sentinam.—Gregariis militibus.—Sibi quisque, si in armis foret, ex victoria talia sperabat.—Quicumque aliarum atque senatus partium erant.—Postquam Cn. Pompeio et M. Crasso consulibus tribunicia potestas restituta est.—Contra eos summa ope nitebatur pleraque nobilitas senatus specie pro sua magnitudine.—Sed postquam Cn. Pompeius ad bellum maritumum atque Mithridaticum missus est.—Ceterosque iudiciis terrere, quo plebem in magistratu placidius tractarent.—Aequa manu discessisset.—Sollicitabat, neque solum civis, sed cuiusque modi genus hominum, quod modo bello usui foret.—Accusare senatum quod in eo auxili nihil esset.—Quod foro propinqua erat neque aliena consili propter Sempronium.—Praeterea Gabinium arcessit, quo maior auctoritas sermoni inesset.—Uti eos quam maxume manifestos habeant.—Eo signo proxuma nocte cetera multitudo coniurationis suum quisque negotium exequeretur.—Fac cogites in quanta calamitate sis.—Postquam ad id loci legati cum Volturcio venerunt.—Poenam illorum sibi oneri, impunitatem perdundae rei publicae fore credebat.—Post ubi fide publica dicere iussus est.—Ceteri in liberis custodiis habeantur.—Incendium vero crudele inmoderatum ac sibi maxume calamitosum putabat, quippe cui omnes copiae in usu cotidiano et cultu corporis erant.—Patrocinio.—Atque ementiundo quae se ex Volturcio aut Allobrogibus audisse dicerent.—Dum haec in senatu aguntur.—Frequens senatus.—Pedibus in sententiam Ti. Neronis iturum se dixerat, quod de ea re praesidiis additis referundum censuerat.—Ubi intenderis ingenium, valet.—Bello Macedonico, quod cum rege Perse gessimus.—Indutias.—Neu magis irae vostrae quam famae consulatis.—Deliquere.—Aerumnarum.—An quia lex Porcia vetat.—Sin quia levius est, qui convenit in minore negotio legem timere, cum eam in maiore neglegeris.—Triginta viros inposuere, qui rem publicam eorum tractarent.—Publicandas eorum pecunias.—Neu quis de eis postea ad senatum referat.—Atque etiam armatos dimittatis, ne ista vobis mansuetudo et misericordia, si illi arma ceperint, in miseriam convortat.—Ubi socordiae te atque ignaviae tradideris, nequiquam deos inplores.—Videlicet cetera vita eorum huic sceleri obstat.—Faucibus urget.—Senati decretum fit.—Nihil denegare quod dono dignum esset.—Bellum novom exoptabat, ubi virtus enitescere posset.—Qui mihi atque animo meo nullius umquam delicti gratiam fecissem, haud facile alterius lubidini, alefacta condonabam.—Popularibus coniurationis.—Obnoxius.—Coniuravere nobilissimi cives patriam incendere.—Immo vero.—Senatus in Catonis sententiam discessit.—Est in carcere locus quod Tullianum appellatur.—Eum muniunt undique parietes atque insuper camera lapideis fornicibus iuncta, sed incultu tenebris odore foeda atque terribilis eius facies est.—Vindices rerum capitalium.—Interea servitia repudiabat, cuius initio ad eum magnae copiae concurrebant.—Tramites.—Optumum factu ratus.—Quem neque gloria neque pericula excitant, nequiquam hortere.—Sed ego vos, quo pauca monerem, advocavi.—Cavete inulti animam amittatis.—Nam uti planities erat inter sinistros montis et ab dextera rupe aspera, octo cohortis in fronte constituit, reliquarum signa in subsidio artius conlocat.—Evocatos.—In sinistra parte curare iubet.—Pedibus aeger.—Amplius annos triginta tribunus aut praefectus aut legatus aut praetor cum magna gloria in exercitu fuerat.—Ferentariis.—Comminus.—Fuere item qui inimicos suos cognoscerent.

General Questions.

1. Give an account of the Catilinarian Conspiracy, pointing out the chief differences between Cicero's and Sallust's accounts.
2. What does Sallust say about (*a*) Cæsar, (*b*) Cato, (*c*) Catilina?
3. What was the formula for investing the consuls with dictatorial power?
4. What effect on Cicero's after life had his action in this conspiracy.

5. Write lives of (*a*) Cicero, (*b*) Julius Cæsar, (*c*) Catilina, (*d*) Cato.

6. Mention some archaisms found in Sallust.

7. Turn into *oratio obliqua*—

(*a*) Ch. 20. *sed ego quae.....essemus.*
(*b*) ,, ,, *quae quousque.....amittere.*
(*c*) ,, ,, *vel imperatore.. ...estis.*
(*d*) ,, 52. *nolite enistumare.....illis est.*

8. Quote Cato's and Cæsar's arguments for and against the punishment of the conspirators.

9. Why did Sallust become a historian?

Typical Sentences.

"All of us are aware that the brave Marcellus stopped at Rome from September 23, 64 B.C., to October 12."

Omnes scimus Marcellum virum fortissimum Romae ab ante diem octavum Kalendas Octobres (-is) anno ab urbe condita sexcentesimo nonagesimo ad ante diem quartum Idus Octobres mansisse.

Notes.—(*a*) As we saw in last month's course, September in 64 B.C. had only twenty-nine days. Therefore September 23 is the (29 – 23 + 2) eighth day before the kalends of October. (*b*) The city of Rome was founded 753 B.C. Therefore 64 B.C. is (753 – 64 + 1) the six hundred and ninetieth year from the foundation of the city. (*c*) *Ab urbe condita* literally means, from the "city founded." It is a characteristic Latin idiom to use a past participle and a noun where in English we use two nouns (compare Milton's *Paradise Lost*, which is equivalent to "The Losing of Paradise," *Paradise Regained*, etc.).

"There is no one who ordered such soldiers as these not to attack the town of Capua before the general gave the word of command."

Nemo est qui hos tales milites iusserit non oppidum Capuam oppugnare antequam imperator signum daret.

Notes.—(*a*) Verbs of ordering, as we have seen before, take generally the dative and *ut* and subjunctive. *Iubeo* and *veto*, however, take the accusative and infinitive. (*b*) *Daret* is in the subjunctive, because the sentence is in *oratio obliqua*. It forms part of what was said. (*c*) *Iusserit* is subjunctive, because the antecedent of *qui* is an indefinite word. Such a subjunctive is known as the generic subjunctive. (*d*) As *iusserit* is a secondary tense, the secondary sequence *daret* is required.

"It is said that he stopped in the beautiful city of Naples on April 5 without informing his father of his arrival."

Neapoli in illa pulcherrima urbe nonis Aprilibus mansisse nec patrem de adventa suo certiorem fecisse dicitur.

Notes.—(*a*) "Without" and a verbal noun are expressed (see previous sentences) by *nec*, and the same mood and tense as in the preceding clause, if the preceding clause is a positive one. (*b*) *Dicitur* is used personally—literally, "he is said to have remained." With *dicitur* and *videtur*, as we have mentioned before, the Latins avoided the impersonal construction. (*c*) *Nonis* is ablative of "time when." (*d*) Note how to express "in the beautiful city of Naples." The town is placed first, in the locative case, then the preposition *in* and the ablative.

"No one knows if the boy could have played well on the lyre, if he had been taught by you."

Nemo scit num puer fidibus bene ludere potuerit si a te doctus esset.

Notes.—(*a*) "Could have" and an infinitive are expressed by the perfect tense of *possum* and the present infinitive. Be careful not to use the perfect infinitive after verbs like *possum*, *debeo*, and *oportet*. We have explained the reason in our first sets of typical sentences, but the mistake is such a common one that students require repeated warnings. (*b*) *Fidibus* is the ablative. (*c*) The subjunctive, *doctus esset*, is used because the past tense of *possum*, which forms the apodosis, is equivalent to a subjunctive. By the well-known rule already stated, the subjunctive is used in the protasis or "if" clause, if the subjunctive or its equivalent is used in the principal clause. (*d*) Once more a note of warning with regard to the preposition "by." If it is used with the agent, use *a* or *ab* with the ablative in Latin. If it is used with the instrument, in Latin the simple ablative is used without any preposition. If, however, "by" and the agent are used with the gerundive, the dative is used in Latin. (*e*) "If," when equal to "whether," is translated by *num*, not by *si*.

"We were afraid that you were rather foolish in giving up the town to the treacherous general of the enemy."

Timebamus ne stultior esses qui hostium imperatori homini perfidissimo oppidum tradidisses.

Notes.—(*a*) Note again the construction required by verbs of fearing. (*b*) The comparative often expresses that a person possesses a quality in too high a degree—as, *Senectus loquacior est*, "Old age is too talkative." In this sentence we translate "rather foolish" by *stultior*. (*c*) "In giving up" is equivalent to "since you had given up." Use *qui* and the causal subjunctive.

"I wish that the general had been killed by the mutinous soldiers before he had burned the city."

Utinam dux a militibus seditiosis necatus esset antequam urbem incendisset.

Notes.—Use *utinam* and the pluperfect subjunctive to express a wish that cannot be realised. In English we generally express such past wishes by "I wish" and a "that" clause. "Would that," in English prose, would sound rather strange. If a negative has to be used in wishes, the negative is *ne*, and not *non*.

"We shall not answer till they are silent."

Non respondebimus donec taceant (tacuerint).

Note.—The subjunctive can be used here with *donec*, as there is a notion of purpose or result; or you can use the future perfect indicative, *not* the present indicative. "They are silent" is equivalent to, "they shall have been silent," or "they may be silent."

"He is not the kind of man to help the needy and wretched."

Non is est qui inopibus et miseris subveniat.

Notes.—(*a*) Note that *is.....qui* with subjunctive expresses "just the man to;" *is.....qui subvenit* means, "is the man who helps." (*b*) *Qui* in the sentence above = "such as who;" the subjunctive is generic or descriptive. (*c*) *Subvenio* governs the dative.

"When Marcellus fell severely wounded by a javelin in the thigh, the panic that seized the citizens of Rome was so great that the town was all but abandoned."

Cum Marcellus femore pilo graviter vulnerato cecidisset tantus terror cives Romanos invasit ut haud multum abesset quin oppidum desereretur.

Notes.—(*a*) *Cum* with a past tense, if "since" or "although" can be substituted for it, requires in Latin the subjunctive; hence *cecidisset*. (*b*) "All but" is generally translated by *haud multum abesse quin*—literally, "it was not far absent but that." (*c*) *Ut*, meaning "so that," requires the subjunctive. (*d*) *Femore vulnerato*, ablative absolute. (*e*) *Pilo*, ablative of instrument. (*f*) Note that "citizen of Rome" is *civis Romanus*, not *civis Romae*.

Sentences for Practice.

(Readers can have their solutions corrected by sending them to the Editor, Matriculation Course, *P.T.*, and enclosing seven stamps.)

1. The consuls of that year had perished—one by disease, the other by the sword.
2. See to it that the enemy does not attack us unawares.
3. You are unworthy to command an army of brave men.
4. How comes it that all men know our plans?
5. All the property of the citizens was given up to the soldiers to be plundered.
6. You rightly think about me that nothing is farther from my thoughts than cruelty.
7. Am I not to follow him whom all allow to be the chief man of our country?
8. May the gods grant that our country and our homes remain unharmed.
9. Let us remember that justice should be observed even towards the poorest.

Test Paper.

(Readers can have their answers corrected by enclosing seven stamps to Editor, Matriculation Course.)

1. Give the gender of *ius*, *palus*, *vertex*, *unguis*. Decline the former two in the singular, and the latter two in the plural.
2. Write down the supine in *-um* of *exuo*, *aufero*, *haurio*, *facesso*, *sterno*, *crepo*, *tundo*, *censeo*.
3. What are the comparatives corresponding to *facillime*, *nequissimus*, *maleficentior?*
4. Into what classes may the uses of the subjunctive mood be divided? Give a specimen of each class.
5. Show how to express the following in Latin:—(1) This is an easy thing to say; (2) Four months ago; (3) The fifth of July; (4) Condemned for theft; (5) Go close to the walls; (6) My name is Marcus; (7) Heir to half the property; (8) This was bought for two denarii.
6. What constructions are ordinarily found with *taedet*, *deterreo*, *posco*r, *ecce*, *caveo*, *muto*, *nubo*, *oportet*, *afficio*, *misereor?*
7. Write the following in *oratio recta*:—Nunquam ante hoc tempus exercitum populi Romani Galliae provinciae finibus egressum. Quid sibi vellet? Cur in suas possessiones veniret? Debere se suspicari simulata Caesarem micitia quod exercitum in Gallia habeat sui opprimendi ciausa habere. Quod si eum inter-

fecerit, multis esse nobilibus principibusque populi Romani gratum esse facturum; id se ab ipsis per eorum nuntios compertum habere, quorum omnium gratiam atque amicitiam eius morte redimere posset.

ARITHMETIC COURSE.

A general revision of the subject, together with chapter xl. of Pendlebury.

Solutions to examples:—

1. At 5 per cent., £100 in one year amounts to £105, and £105 in one year amounts to £110¼.

So that £110¼ is the amount of £100.

$\therefore$ £88½ is the amount of £$\frac{88\frac{1}{2} \times 100}{110\frac{1}{4}}$; that is, of £80.

2. From the question it is clear that £160⅔ is the amount of £150 in two years (C.I.).

Let the per cent. be such that £R is the amount of £1 in one year, so that £150R would be that of £150, and therefore $150R^2$ would be the amount of £150 in two years.

$\therefore 150R^2 = £160\frac{2}{3}$.

$\therefore R^2 = £\frac{961}{900}$, or $R = £\frac{31}{30}$.

$\therefore$ £100 in one year amounts to £$\frac{31 \times 100}{30}$, or £103⅓.

$\therefore$ the per cent. is 3⅓.

GEOMETRY COURSE.

All the Euclid should be revised.

Solutions to riders:—

1. This is proved in the course of I. 47.

2. This important rider is solved at the end of Book III. in Hall and Stevens.

ALGEBRA COURSE.

Read chapter xxxiv. of Hall and Knight, and revise previous work.

Solutions to examples:—

1. Let $3r$ and $3r^2$ be the numbers so that 3, $3r$, $3r^2$, and 18 are the four numbers of which $3r$, $3r^2$, and 18 are to be in A.P.

$\therefore 3r^2 - 3r = 18 - 3r^2$.

$\therefore 2r^2 - r - 6 = 0$.

$\therefore (2r + 3)(r - 2) = 0$.

$\therefore r = 2$ or $-\frac{3}{2}$.

So that 3, 6, 12, 18, or 3 − ⅔, ⁷⁄₂, 18, are the numbers required.

2. $(x - 3y)^3 + (2x - y)^3 + (4y - 3x)^3 - 3(x - 3y)(2x - y)(4y - 3x)$
$= [(x - 3y) + (2x - y) + (4y - 3x)][(x - 3y)^2 + (2x - y)^2 + \ldots]$
$= (0)[(x - 3y)^2 + (2x - y)^2 + \ldots] = 0$.

From this the required result follows.

3. $a^4 + 64 = a^4 + 16a^2 + 64 - 16a^2$
$= (a^2 + 8)^2 - (4a)^2$
$= (a^2 + 4a + 8)(a^2 - 4a + 8)$.

SCIENCE COURSE.

Read chapters xvii. and xviii. of the Hydrostatics portion of Briggs and Bryan, and get up carefully a description of the various forms of electric batteries.

A revision of Loney's *Mechanics* for those taking Mechanics.

Illustrative examples:—

1. If x, y, z, u be positive integers, show that $\frac{x}{y}$, $\frac{y+z}{y+u}$, and $\frac{z}{u}$ are either in ascending or descending order of magnitude.

$$\frac{x}{y} = \frac{xu(y+u)}{yu(y+u)} = \frac{xuy + xu^2}{yu(y+u)} \quad \ldots\ldots (a)$$

$$\frac{x+z}{y+u} = \frac{yu(x+z)}{yu(y+u)} = \frac{xuy + uyz}{yu(y+u)} \quad \ldots\ldots (b)$$

$$\frac{z}{u} = \frac{zy(y+u)}{yu(y+u)} = \frac{zy^2 + zuy}{yu(y+u)} \quad \ldots\ldots (c)$$

Suppose now that (b) is greater than (a)—that is, that $xuy + uyz$ is greater than $xuy + xu^2$.

$\therefore uyz$ is greater than xu^2.

$\therefore yz$ is greater than xu.

$\therefore y^2z$ is greater than xuy.

$\therefore zy^2 + zuy$ is greater than $xuy + zuy$—that is, (c) is greater than (b), and hence (a), (b), and (c) are in ascending order.

Similarly, if we suppose (a) less than (b), we could show that (b) must be less than (c) or (a), (b), and (c) to be in descending order.

2. A person has a certain amount of 4 per cent. stock; he sells it at £117½, and inveats half the proceeds in 2 per cent. stock at 96, and the rest in 3 per cent. stock at 99. By so doing his income is reduced by £20. What amount of original stock had he? (January 1887.)

Let x = £100 of original stock.

$\therefore$ £$4x$ = original income.

Proceeds of sale at £117½ per share = £$\frac{352x}{3}$.

Income produced by investing £$\frac{176x}{3}$ in 2 per cent. stock at 96

$$= £\frac{176x + 2}{3 + 96} = £\frac{11x}{9}.$$

Income from investment of £$\frac{176x}{3}$ in 3 per cents. at 99

$$= £\frac{176x + 3}{3 + 99} = £\frac{16x}{9}.$$

$$\therefore \frac{11x}{9} + \frac{16x}{9} = 4x - 20. \quad \therefore x = 20.$$

So that he had £2000 of original stock.

3. Find the series the sum of n terms of which is given by the formula $s = \frac{n(3n+1)}{2}$.

Here sum of n terms $= \frac{n(3n+1)}{2}$.

$\therefore$ sum of $(n-1)$ terms $= \frac{(n-1)(3n-3+1)}{2} = \frac{(n-1)(3n-2)}{2}$.

Subtracting, we get—

nth term = (sum of n terms) − (sum of $n-1$ terms)

$$= \frac{n(3n+1) - (n-1)(3n-2)}{2} = 3n - 1.$$

$\therefore$ 1st term $= (3 \times 1) - 1 = 2$.

2nd term $= (3 \times 2) - 1 = 5$.

3rd term $= (3 \times 3) - 1 = 8$.

Or series is 2, 5, 8, 11 . . .

4. A force of 50 lbs. acts for 10 seconds on a mass of 100 lbs. Find the momentum and energy acquired.

By formula, $P = mf$.

$50 \times 32 = 100f$, or $f = 16$ ft./sec².

$\therefore v$ = ft. $= 10 \times 16 = 160$ ft. per sec.

$\therefore$ momentum $= mv = 50 \times 160 = 8000$ units.

Energy $= \frac{1}{2}mv^2 = \frac{1}{2} \times 50 \times 160^2$ ft.-poundals

$$= \frac{50 \times 160 \times 160}{2 \times 32} \text{ ft.-lbs.}$$

$= 20{,}000$ ft.-lbs.

Note unity of momentum = momentum possessed by a mass of 1 lb. moving with a velocity of 1 ft. per sec.

5. Solve $(3x + 2y - 5)^2 + (5x - 2y - 3)^2 = 0$.

All squares being positive quantities, two squares can only add to zero if each is itself zero.

$\therefore 3x + 2y - 5 = 0$, and $5x - 2y - 3 = 0$.

Solving, we get by usual method $x = y = 1$.

6. If the product of three consecutive odd integers be increased by four times the middle one, prove that the sum will be a perfect cube.

Let $2n - 1$, $2n + 1$, $2n + 3$ be three consecutive odd integers.

We have to prove $(2n - 1)(2n + 1)(2n + 3) + 4(2n + 1)$ to be a perfect cube.

This expression $= (4n^2 - 1)(2n + 3) + 8n + 4$
$= 8n^3 + 12n^2 + 6n + 1$
$= (2n + 1)^3$, as required.

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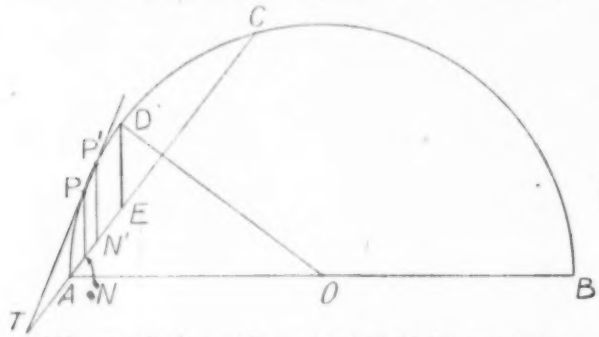
RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Ousel.—AB is a diameter of a circle, and C is a point in the circumference. Find a point D in the smaller arc AC such that if DE be drawn perpendicular to AB to meet AC in E, the intercept DE will be a maximum. (London B.Sc., 1900.)

Take two points, P, P′, close together on the arc AC. Join PP′, and produce to meet CA produced in T. Draw PN, P′N′ perpendicular to AB, meeting AC in N, N′ respectively.



In the similar triangles PNT, P′N′T, we have $\frac{P'N'}{PN} = \frac{N'T}{NT}$, which is greater than unity. ∴ P′N′ is greater than PN.

In the limit, as P′ approaches nearer and nearer to P, PT becomes the tangent at P.

Imagine P to move on the arc AC towards C, and the above construction to be made in each position. PN will go on increasing until a point is reached where the tangent at P is parallel to AC. This occurs at D, where OD is drawn perpendicular to AC.

In the same way, as P proceeds from D to C, PN will be decreasing, the point T being now on AC produced in the opposite direction.

Hence D is the point required.

ϕ.—A cylindrical diving-bell is lowered into water. Neglecting the thickness of the bell, draw a curve showing how the tension varies, starting from the position in which the bell is just immersed.

This query is not stated clearly enough to enable a definite answer to it to be given; and as the source from which it is obtained is not stated, the missing data cannot be supplied. Assuming, however, that what is meant is to draw a curve showing how the tension of the chain supporting the bell varies as the bell is lowered, if A denote the area of cross-section of the bell, and if at any depth h the length of the bell occupied by the air is x, then the volume of water displaced by the bell is Ax, the weight of water displaced, and therefore the upward pressure of the water is Axw, where w is the weight of unit volume of water. The value of x for any depth h can be obtained from Boyle's Law. As the simple calculations necessary are to be found in any text-book, it is not necessary to do more than refer to it here.

If T denote the tension of the chain supporting the bell, and W the weight of the bell, then we have—

$$T = W - Axw. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

Assuming a series of value for h, the corresponding values of x can be found, and the values of T from (1). In this manner a series of values of h and T are obtained; plotting these, the curve connecting the two can be drawn.

It will be found that the curve will show, what is also obvious from (1), that as h increases x diminishes, and therefore, as W remains constant, the value of T (or the tension of the chain) increases with the depth.

Felix.—If a, b, c, d be four unequal quantities in arithmetical progression, and $a^2 + b^2$, $b^2 + c^2$, $c^2 + d^2$ be in geometrical progression, prove that $b^2 - 4bc + c^2 = 0$. (Cambridge Senior, 1897.)

Since a, b, c, d are in A.P., we get—

$$a = b - (c - b) = 2b - c,$$
$$\text{and } d = c + (c - b) = 2c - b.$$

Since $a^2 + b^2$, $b^2 + c^2$, $c^2 + d^2$ are in G.P., we get—

$$(a^2 + b^2)(c^2 + d^2) = (b^2 + c^2)^2;$$
$$\text{or, } [(2b - c)^2 + b^2][c^2 + (2c - b)^2] - (b^2 + c^2)^2 = 0,$$
$$(5b^2 - 4bc + c^2)(b^2 - 4bc + 5c^2) - (b^2 + c^2)^2 = 0.$$

Multiplying out, we get—

$$5b^4 + 5c^4 - 24b^3c - 24bc^3 + 42b^2c^2 - (b^2 + c^2)^2 = 0;$$
$$\text{or, } 5(b^4 + 2b^2c^2 + c^4) - 24bc(b^2 + c^2) + 32b^2c^2 - (b^2 + c^2)^2 = 0,$$
$$4(b^2 + c^2)^2 - 24bc(b^2 + c^2) + 32b^2c^2 = 0,$$
$$(b^2 + c^2)^2 - 6bc(b^2 + c^2) + 8b^2c^2 = 0,$$
$$(b^2 + c^2 - 2bc)(b^2 + c^2 - 4bc) = 0,$$
$$(b - c)^2(b^2 + c^2 - 4bc) = 0.$$

Now, the quantities are unequal, therefore $(b - c)$ cannot be zero, hence $b^2 + c^2 - 4bc = 0$.

Duffer.—A man bought 100 animals for £100. He bought fowls at 1s. each, sheep at £1 each, and pigs at £5 each. How many of each kind did he buy?

Let x be the number of fowls bought, and y the number of pigs. The number of sheep will be $100 - x - y$. He spent £100; therefore

$$£\frac{x}{20} + £5y + £(100 - x - y) = £100,$$
$$\text{or } 4y - \frac{19}{20}x = 0.$$
$$80y = 19x.$$
$$\therefore y = \frac{19}{80}x.$$

Since y must be a whole number, x must be 80, or some multiple of 80. But if $x = 160$,

$$y = \frac{19}{80} \times 160 = 38,$$

which is obviously too many, since 38 pigs cost £190.

Hence x must be 80, y must be 19, and the number of sheep $(100 - x - y) = 1$.

Puzzled.—The solid contents of a sphere being $\frac{4}{3}$ of $\frac{355}{113}$ of a cube, the side of which is the radius of the sphere, and a cubic foot of iron weighing 450 lbs., find the diameter (in inches and tenths of an inch) of a 68 lb. cannon-ball.

(Barnard Smith's *Arithmetic.*)

The volume of the cannon-ball $= \frac{68}{450}$ cubic ft.

$= \frac{68 \times 1728}{450}$ cubic ins.

But the volume is also $= \frac{4}{3} \times \frac{355}{113}$ (radius of sphere)^3.

$\therefore$ (radius)$^3 \times \frac{4}{3} \times \frac{355}{113} = \frac{68 \times 1728}{450}$.

$$(\text{radius})^3 = \frac{68 \times 1728 \times 3 \times 113}{4 \times 355 \times 450}$$

$$= 62{\cdot}33.$$

$\therefore$ radius $= 3{\cdot}96$, and diameter $= 7{\cdot}9$ ins.

Perplexed.—Find the fifth root of 7. (Soc. of Arts.)

Using a table of four-figure logarithms, we find that

$$\log 7 = {\cdot}8451.$$

Now $\log \sqrt[5]{7} = \frac{1}{5} \log 7 = {\cdot}1690$.

The number whose logarithm is ·1690 is given by the table to be 1·476. Ans.

Raffles.—Two weights connected by a string, length a, are held in contact. One falls, and after a time t $\left(\text{less than } \sqrt{\frac{2a}{g}}\right)$ the other is let go. Show that, after the second starts, a time $\frac{2a - gt^2}{2gt}$ elapses before the string tightens; and that the kinetic energy lost when the string tightens is $\frac{1}{2} \frac{ww'}{w + w'} gt^2$, where w and w' are the weights. (Senior Cambridge Local, 1900.)

Let the time which elapses between the start of the second weight and the string tightening be t'.

In time $(t + t')$ the first has fallen through a space of $\frac{1}{2}g(t + t')^2$.

In time t' the second has fallen through a space of $\frac{1}{2}gt'^2$.

When the string is tight, the difference between these two spaces will be equal to a.

$$\therefore a = \tfrac{1}{2}g[(t + t')^2 - t'^2] = \tfrac{1}{2}g(t^2 + 2tt').$$

$$\therefore t' = \frac{2a - gt^2}{2gt}.$$

Now, let v, v' be the velocities of w, w' respectively at the instant before the string tightens, and V be the common velocity at the instant after the string tightens.

Then, since there is no *change of momentum* due to the tightening, we get—

$$\frac{w}{g}v + \frac{w'}{g}v' = \frac{w + w'}{g}\text{V}.$$

$$\therefore \text{V} = \frac{wv + w'v'}{w + w'}.$$

The energy lost will be

$$\frac{wv^2}{2g} + \frac{w'v'^2}{2g} - \frac{(w + w')\text{V}^2}{2g}$$

$$= \frac{1}{2g}\left[wv^2 + w'v'^2 - \frac{(w + w')(w^2v^2 + 2wvw'v' + w'^2v'^2)}{(w + w')^2}\right]$$

$$= \frac{1}{2g}\left[\frac{ww'}{w + w'}(v - v')^2\right].$$

But $v - v' = g(t + t') - gt' = gt$.

$$\therefore \text{Energy lost} = \frac{1}{2g}\left[\frac{ww'}{w + w'}g^2t^2\right] = \tfrac{1}{2}\frac{ww'}{w + w'}gt^2.$$

Want of space prevents us from obliging with solutions to all the queries you send.

May.—£1000 put out at compound interest doubled itself in 24 years. What would be the amount in 12 years?

If r be the rate of interest, then the amount at the end of the first year would be $£1000\left(1 + \frac{r}{100}\right)$.

At the end of 2 years, amount

$$= \left[£1000\left(1 + \frac{r}{100}\right)\right]\left(1 + \frac{r}{100}\right)$$

$$= £1000\left(1 + \frac{r}{100}\right)^2.$$

At the end of 24 years, amount

$$= £1000\left(1 + \frac{r}{100}\right)^{24}.$$

$$\therefore £1000\left(1 + \frac{r}{100}\right)^{24} = £2000,$$

$$\text{or, } \left(1 + \frac{r}{100}\right)^{24} = 2.$$

$$\therefore \left(1 + \frac{r}{100}\right)^{12} = \sqrt{2} = 1{\cdot}414213.$$

Amount at end of 12 years

$$= £1000\left(1 + \frac{r}{100}\right)^{12}$$

$$= £1000 \times 1{\cdot}414213$$

$$= £1414, 4\text{s. } 3\text{d. nearly.}$$

Paddock.—(1) Prove that

$$(ad + bc)^2 + (b^2 - d^2)\{(a + b)^2 - (c - d)^2\}$$

is a perfect square.

(2) Show that if $2s = a + b + c$, then

$$b^2c^2 - 4s(s - a)(s - b)(s - c) = \tfrac{1}{4}(b^2 + c^2 - d^2)^2.$$

(1) The given expression is equal to

$$a^2d^2 + 2abcd + b^2d^2 + a^2b^2 + 2ab^2 + b^4 - b^2c^2 - b^2d^2 + 2b^2cd - a^2d^2 - 2abd^2 - b^2d^2 + c^2d^2 + d^4 - 2cd^3$$

$$= (b^4 - 2b^2d^2 + d^4) + a^2b^2 + 2ab(2ab^2 + 2b^2cd - 2abd^2 - 2cd^3) + (a^2b^2 + 2abcd + c^2d^2)$$

$$= (b^2 - d^2)^2 + b^2(2ab + 2cd) - d^2(2ab + 2cd) + (ab + cd)^2$$

$$= (b^2 - d^2)^2 + 2(b^2 - d^2)(ab + cd) + (ab + cd)^2$$

$$= (b^2 - d^2 + ab + cd)^2.$$

(2) Prove that

$$b^2c^2 - \tfrac{1}{4}(b^2 + c^2 - a^2)^2 = 4s(s - a)(s - b)(s - c).$$

$$b^2c^2 - \tfrac{1}{4}(b^2 + c^2 - a^2)^2$$

$$= \tfrac{1}{4}[4b^2c^2 - (b^2 + c^2 - a^2)^2]$$

$$= \tfrac{1}{4}[\{2bc - (b^2 + c^2 - a^2)\}\{2bc + (b^2 + c^2 - a^2)\}]$$

$$= \tfrac{1}{4}[\{a^2 - (b - c)^2\}\{(b + c)^2 - a^2\}]$$

$$= \tfrac{1}{4}[(a - b + c)(a + b - c)(b + c - a)(b + c + a)].$$

Now, since $a + b + c = 2s$,

$$\therefore a + b - c = 2s - 2c = 2(s - c).$$

Similarly, $a + c - b = 2(s - b)$, and $(b + c - a) = 2(s - a)$.

$\therefore$ above expression $= 4[s(s - a)(s - b)(s - c)]$.

Rex.—If $pu^{1{\cdot}0646} = 479$, find the value of p when $u = 4$. Also find u when $p = 203$.

(*Lectures on Practical Mathematics*, Professor Perry.)

Taking logarithms all through the given equation, we get—

$$\log (pu^{1{\cdot}0646}) = \log 479$$

$$\log p + 1{\cdot}0646 \log u = \log 479$$

$$\log p = 2{\cdot}6803 - 1{\cdot}0646 \times {\cdot}6021$$

$$= 2{\cdot}6803 - {\cdot}6412 = 2{\cdot}0391.$$

Using the table of antilogarithms, we find that this gives 109·4 for the number whose logarithm is 2·0391.

Hence, $p = 109{\cdot}4$. Ans.

If $p = 203$, we get—

$$\log 203 + 1{\cdot}0646 \log u = \log 479;$$

$$\text{or, } \log u = \frac{\log 479 - \log 203}{1{\cdot}0646}$$

$$= \frac{2{\cdot}6803 - 2{\cdot}3075}{1{\cdot}0646} = {\cdot}3500.$$

Table of antilogarithms gives $u = 2{\cdot}239$. Ans.

F. S. Long.—Solution by post on application.

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BOARD OF EDUCATION, SOUTH KENSINGTON, LONDON, S.W.

PRINCIPAL ALTERATIONS IN THE DIRECTORY FOR 1901.

(Form 957.)

THE Directory of the Board of Education, South Kensington (hitherto known as the Science and Art Directory), for the session 1901–1902, will be published at an early date, but it will be convenient that managers of schools should be acquainted at once with the following important changes which are contemplated. These changes relate to—

(*a*) The formation of evening classes for providing instruction in groups of science and art subjects.

(*b*) The formulation in day schools (not being public elementary schools) of schemes of instruction for a three or four years' course in science.

(*a*) Evening Classes for Providing Instruction in Groups of Science and Art Subjects.

1. Well-appointed evening schools and classes may submit for the approval of the Board of Education schemes and time-tables for grouping together cognate science and art subjects. This grouping will only be permitted where the students are actually in training for a trade or craft under some recognised educational authority, and where the subjects selected for grouping are those necessary for the instruction in the principles underlying such trade or craft. The time to be given to instruction in each subject of the proposed group must be clearly indicated in the scheme submitted for approval. The qualifications of the teacher in respect of each subject must be in accordance with the requirements laid down in the Directory.

2. In each group at least fifty lessons must be given by the teachers.

3. A special group register must be kept. Students registered in it cannot, at the same time, be registered for instruction in the separate subjects of science or art which are already approved for inclusion in the group.

4. Students must be registered for either elementary or advanced instruction in the group. No student may be registered for more than six years in the elementary and advanced courses, nor for more than four years in either the elementary or the advanced course of a specially-recognised group. Where an advanced course is proposed, the instruction in it must, as a rule, be confined to a smaller number of subjects than that which may be suitable for the elementary course.

5. Each student must make a minimum of twenty-eight attendances per session, and his or her instruction must cover at least two subjects of the group.

6. Payments up to a hundred and twenty attendances in one year in either course of a group may be made in respect of each student.

7. The rate of payment for the elementary course of a group will be from one penny to a sixpence per attendance, or one penny to ninepence where practical science forms part of the instruction.

The rate of payment in the advanced course will be from fourpence to one shilling and fourpence per attendance, and the amount of practical work undertaken will be considered in assessing it.

(*b*) Courses in Science in Day Schools.

A day school (not being a public elementary school) conducted in the manner prescribed by Section vi. of the Directory, revised to July 1900, may submit a scheme of instruction for a three or four years' course in science for forms in which the average age of the students is above twelve, and which are reported by the inspector as able to benefit by such instruction, provided that the number of qualified students is not less than twenty.

The time-table of the whole curriculum of the school must be submitted to the Board of Education, showing that it makes provision for not less than nine hours per week of science instruction, including not more than five hours of mathematics, as in Subject v., Stages 1, 2, 3. Instruction in science must be both theoretical and practical, the latter being conducted in such laboratories as are reported by the inspector to be suitably equipped for the subjects sanctioned.

The requirements as to registration and age of students, length of lessons, qualifications of teachers, and size of classes, are those laid down in Sections lv. to lx. of such Directory. The commencement of any school term may be recognised as the commencement of the school year, upon the managers making application to the Board at least one month previous to the date proposed.

Every student must attend all the yearly courses in the prescribed sequence, except that a student whose previous instruction is equivalent to that given in the course laid down for one or more years may, with the approval of the inspector, be placed in the year's course above that to which he is held to have attained.

Grants will be paid to these schools for each student who has received continuous instruction throughout the year, and who has made not less than two hundred and forty school attendances in such year, at the following rates :—

For the first hundred students—

For the first and second years' attendance a sum of fifty shillings.

For the third and fourth years' attendance a sum of seventy shillings.

For students in excess of one hundred—

For the first and second years' attendance a sum of forty shillings.

For the third and fourth years' attendance a sum of sixty shillings.

In calculating the payments to schools claiming for students in excess of one hundred, the numbers in the first hundred on whom the seventy shillings and the fifty shillings grants respectively will be paid will be determined by the proportion that the total number of first and second years' students bears to the total number of third and fourth years' students.

Thus, in a school of one hundred and sixty students on whom a grant is claimable, and of whom forty are in the third and fourth years, the first hundred payments will be made on seventy-five first and second years' students, and twenty-five third and fourth years' students.

From the beginning of the school session 1904–1905, 20 per cent. of the students on whom grants are claimable must, as a rule, be third or fourth year's students, and grants for first and second years' students combined will not be claimable on more than four times the number of third and fourth years' students combined.

All schools applying for and receiving recognition under this section will be held to have applied for inspection under the Board of Education Act, 1899, and will accordingly be inspected at such periods as the Board shall determine; and the grants may be diminished or withheld, should the inspector's report of the general efficiency, and especially that of the science teaching, be unfavourable. The inspection of the science course will not be confined to the periodical inspection above mentioned, and the school must at all times during the hours of instruction be open to the officers of the Board.

Students of a school which takes the authorised course will not be eligible to earn other grants for any science subject under the Board.

PHYSIOGRAPHY

(ADVANCED AND HONOURS).

The Heat of the Sun.—A solar calorimeter depending on the rate of generation of steam has been invented and used in Egypt by Mr. J. W. Buchanan. The apparatus and some results of its working are described in *Nature* for April 4, and also in *Cambridge Philosophical Transactions for 1900*, vol. xi., pp. 37–74. The apparatus consists of a mirror in the form of three conical frustra, whereby the rays of the sun are reflected on to a blackened silver tube thirty-seven millimetres in length. The arrangement of the apparatus is such that, when once a steady condition of things has been arrived at, the whole of the heat absorbed by the boiler is utilised for the conversion of water at the boiling point into steam, which is collected and condensed, and the heat given up in the condensation is used to raise the water supplied by the boiler to the required temperature. The area of the reflecting surface is 904 sq. cm., whilst that of the surface of the boiler is 18·8 sq. cm.

Experimenting in Egypt, Mr. Buchanan has obtained concordant results at different solar altitudes. The final result gives the intensity of the rays of the vertical sun as equal to about one-horse power per square metre at sea level, which corresponds to 1·588 grams of water raised 1° C. per square metre per minute outside the atmosphere.

A value of 7073° C. is obtained as the effective absolute temperature of the sun; and albeit this value is given by Mr. Buchanan with reservation, it agrees so closely with the value obtained by Scheiner—namely, 7010° C.—as to leave little suspicion as to the trustworthiness of the method. For further details we refer our readers to the sources above named.

Origin of Atmospheric Electricity.—The Belgian review *Ciel et Terre* observes that we are to-day in possession of a rational theory as to the origin of atmospheric electricity which rests upon a solid basis of fact. Elster and Geitel on the one hand, with Thomson and Wilson on the other, have found an explanation of the known facts in the properties of ionised gases. The rays of the sun, and more especially the ultra-violet rays, ionise the atmosphere and produce equal quantities of ions charged negatively and positively respectively. In dry air the positive and negative ions are present in equal number and are equal in activity, hence their charges develop no appreciable electric potential. When, however, the air is cooled below the dew point, the negative ions serve mainly as nuclei round which the moisture collects in drops, which, in falling to the earth as rain, carry with them the negative ions, and leave behind in the atmosphere an excess of positive ions. This excess gives rise to very high electric potentials, which are therefore coincident with a fall of rain. As before said, the statements above made as to the ionisation of the air by the ultra-violet rays of the solar spectrum, the collection of moisture round the negative ions, etc., are well-authenticated facts, which makes the theory above outlined as to the origin of atmospheric electricity all the more probable, if not actually certain.

Measurements of Saturn.—Recent measurements of Saturn show that the outer ring, with a total width of 11,850 miles, has an external diameter of 173,200 miles. The central ring, 17,190 miles wide, is 145,830 miles in outside diameter. The planet's equatorial diameter is 74,950 miles, whilst its polar diameter is 67,350 miles. The diameter of its satellite Titan is 2,100 miles. The mean density of the planet is 0·679.

Cloud Heights.—Using a base line of 1,552 metres and ordinary surveyor's theodolites, the meteorological service of Toronto Observatory has made some interesting experiments as to the heights of clouds, which we summarise as follows:—The highest cirrus of 1896 was 10,000 feet above the sea level; it had a velocity of 79 miles an hour. The lowest cirrus of the same year was 8,100 metres, and it had a velocity of 55 miles. In June 1897 altitudes exceeding 11,000 metres were obtained, with velocities of from 100 to 150 miles per hour. Mean cloud height during the summer was 10,900 metres; mean velocity was 40 miles. In winter these figures were 9,978 metres and 26 miles. The mean heights of the lowest cloud, the cumulus, were 1,697 metres in summer and 1,326 metres in winter, the mean velocity being only about 10 miles per hour.

Nova Persei a Periodic Variable.—The opinion appears to be growing that the Nova is subject to a waxing and waning in respect to brilliancy. At a recent meeting of the Royal Astronomical Society, Mr. Whittaker said it appeared that, while the light of the new star was steadily diminishing, there had been fluctuations of brightness to the extent of about a magnitude and a half. Minima were observed on March 22, 25, 28, and 31, and April 3, 6, and 13; whilst maxima are claimed for February 23 and 28, March 10 and 27, and April 13 and 18.

CHEMISTRY NOTES.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),
First Class Honoursman in Chemistry.

Gases and Boyle's Law.—It has long been known that no gas conforms strictly and invariably to Boyle's Law. The following statements by Professor Battelli under this head will be read with interest:—Hydrogen obeys Boyle's Law for pressures below one atmosphere down to about 0·2 millimetre. Air deviates slightly from obedience to the law between 2 and 5 millimetres. Oxygen exhibits a discontinuity at about 0·7 millimetre. Carbon dioxide at low pressure is compressed more than the law suggests, but this is thought to be due to absorption by the walls of the vessel containing the gas. The discrepancies in air and oxygen were not known previous to the researches of Professor Battelli. The observed discrepancies are probably due to changes in the grouping of the molecules.

Action of HClO on Metallic Chlorides.—When a solution of sodium chloride is treated with a small quantity of hypochlorous acid and evaporated to dryness, under certain conditions a residue is obtained which gives an alkaline reaction with phenol phthalein. The same result is obtained with potassium chloride or with barium chloride. If a stream of carbon dioxide is led into a boiling solution of barium chloride, and a solution of hypochlorous acid added drop by drop, barium carbonate separates out after a time, and at a definite concentration of the solution. If anhydrous calcium chloride is dissolved in the smallest possible quantity of hypochlorous acid solution, an energetic evolution of Cl at once takes place; if carbon dioxide is now led into the boiling solution, a precipitate of calcium carbonate is immediately produced; when the solution is heated for a longer time without the introduction of carbon dioxide, calcium hydroxide separates, and the solution becomes strongly alkaline. The conditions under which metallic hydroxides are produced from hypochlorous acid and chlorides are those which, according to Förster and Jorre, favour most the formation of chlorates. The author considers that the production of chlorates under these conditions is preceded by the formation of alkali hydroxide, which is converted first into hypochlorite, and finally into the chlorate. The action of hypochlorous acid on metallic chlorides may be expressed by the equation

$$HClO + NaCl = NaOH + Cl_2;$$

and the reaction between metallic hydroxides and chlorine may be regarded as reversible, according to the equation

$$2NaOH + Cl_2 \rightleftarrows NaOCl + H_2O.$$

The bearing of these facts upon the formation of bleaching powder is very direct.

Detection and Estimation of Nitric Acid in Combination with the Alkali Metals.—Mr. Perman, B.Sc. of University College, Cardiff, has observed that the nitrates of the alkali metals are decomposed if gently heated with the sulphate of any metal except those of the alkalis. The sulphate of the heavy metal is formed, and red fumes of nitrogen peroxide are evolved. The reaction may be used as a convenient dry test for a nitrate of the alkali metals; the substance is mixed with lead sulphate, for example, or with ordinary alum (anhydrous), and heated, when red fumes will show the presence of the nitrate.

The Quantitative Aspect.—The method may also be applied quantitatively. The nitrate is heated with anhydrous potash alum, at first very gently, and finally at a low red heat, for one or two minutes. If heated by the full flame of the Bunsen burner for any length of time, the aluminium sulphate will decompose; but the complete decomposition of the nitrate is effected before this takes place. The sulphate of the alkali metal remains, together with alumina and the excess of the alum, and nitrogen peroxide and oxygen are expelled. From the loss of weight, which may be calculated as N_2O_5, the percentage of nitric acid in combinations can be estimated. The author has obtained the following results:—

Percentage of NO_3 in KNO_3.

Found.	Calculated.
61·5 61·2 61·3	61·4

It is best to put the alum in the crucible first, and upon this the nitrate; the two need not be mixed if the quantity of nitrate is small—say, from 0·2 to 0·3 gram. The operation takes about two minutes only, and the residue does not stick to the crucible. Unfortunately the method is of no very general application, as the presence of a chloride causes the formation of the volatile aluminium chloride.

ELECTRICITY AND MAGNETISM.

ADVANCED AND HONOURS STAGES.

BY EDWIN EDSER, A.R.C.S., F.PH.S.

7. A circuit is made up of (1) a battery with terminals AB, its resistance being 3 ohms, and its E.M.F. 2·7 volts; (2) a wire, BC, of resistance 1·5 ohms; (3) two wires in parallel circuit,

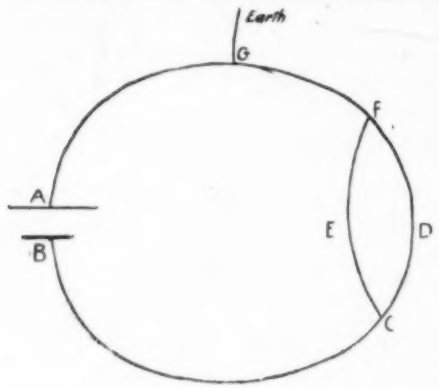

FIG. 2.

CDF, CEF, with respective resistances 3 and 7 ohms; (4) a wire, FA, of resistance 1·3 ohms. The middle point of the last wire is put to earth; find the potential at the points A, B, C, F.

(Advanced, 1897.)

Fig. 2 represents the circuit described. Equivalent resistance R between the points C and F is given by

$$\frac{1}{R} = \frac{1}{3} + \frac{1}{7} = \frac{10}{21}. \quad \therefore R = 2{\cdot}1.$$

Total resistance of circuit = $3 + 1{\cdot}5 + 2{\cdot}1 + 1{\cdot}5 = 8{\cdot}1$ ohms.

$$\therefore \text{ current in circuit} = \frac{2{\cdot}7}{8{\cdot}1} = \frac{1}{3} \text{ ampère.}$$

The middle point G of AF is put to earth, therefore this point is at zero potential. The point A is at a higher potential, whose numerical value is $\frac{1}{3} \times \frac{1{\cdot}5}{2} = +0{\cdot}25$ volt.

Similarly, potential of F = $-0{\cdot}25$ volt.

" " " C = $-0{\cdot}25 - \frac{1}{3} \times 2{\cdot}1 = -0{\cdot}95$ volt.

" " " B = $-0{\cdot}95 - \frac{1}{3} \times 1{\cdot}5 = -1{\cdot}45$ volts.

8. A current of 1 ampère flowing for 1 second through a resistance of 1 ohm produces 0·239 gram-centigrade units of heat. What current would have to flow for an hour through a resistance of 41·84 ohms in order that the heat produced might suffice to raise a kilogram of water from 0° C. to the boiling point?

(Advanced, 1896.)

In order to raise a kilogram of water from 0° C. to 100° C., $1000 \times 100 = 10^5$ gram-centigrade units of heat are required. Also, work done in time t by a current C ampères flowing along a wire of resistance R ohms $= k \times C^2Rt$, where k is a constant. Further, work done in 1 second by 1 ampère flowing through 1 ohm $= k \times 1^2 \times 1 \times 1 = k$. Hence k units of work correspond to 0·239 gram-centigrade units of heat. $\therefore kC^2Rt$ units of work correspond to $\cdot239 \times C^2Rt$ units of heat. Writing R = 41·84 ohms, t = 3600 seconds, we have—

$$\cdot239 \times C^2 \times 41{\cdot}84 \times 3600 = 10^5.$$

$$\therefore C^2 = \frac{10^5}{\cdot239 \times 41{\cdot}84 \times 3600} = 2{\cdot}777.$$

$$\therefore C = \sqrt{2{\cdot}777} = 1{\cdot}666 = 1\tfrac{2}{3} \text{ ampères.}$$

9. A battery of 12 equal cells in series screwed up in a box, being suspected of having some of the cells wrongly connected, is put in circuit with a galvanometer and two cells similar to the others. Currents in the ratio 3 to 2 are obtained according as the introduced cells are arranged to work with or against the battery. What is the state of the battery? Give reasons for your answer. (Advanced, 1895.)

Let E be the E.M.F. of each cell, and let x cells be connected so as to oppose the other $(12 - x)$ cells. In both of the experiments mentioned above, the resistance of the circuit will be the same. Since x cells in the box oppose the other $(12 - x)$ cells, the effective E.M.F. due to the cells in the box will be equal to $(12 - 2x)$. Since the current in the circuit will be proportional to the total effective E.M.F. in the circuit, we have—

$$\frac{\{(12 - 2x) + 2\}E}{\{(12 - 2x) - 2\}E} = \frac{3}{2}. \quad \therefore x = 1.$$

Hence 1 cell was wrongly connected, so as to oppose the remaining 11 screwed up in the box.

10. A circuit is formed of 6 similar cells in series and a wire of 10 ohms resistance. The E.M.F. of each cell is 1 volt, and its internal resistance 5 ohms. Determine the difference of potential between the positive and negative poles of any one of the cells.

(Advanced, 1894.)

$$\text{Current in circuit} = \frac{6}{30 + 10} = \frac{6}{40} = \cdot15 \text{ ampère.}$$

P.D. between + and − terminals of a cell = E.M.F. of cell − fall of potential inside cell $= 1 - \cdot15 \times 5 = \cdot25$ volt.

11. A galvanometer, the resistance of which is $\frac{1}{3}$ ohm, being joined up in circuit with a cell by thick copper wires, the resulting current is noted; and it is found that the current in the galvanometer is halved if, without any other change being made, the terminals of the galvanometer are joined by a wire of resistance 0·1 ohm. What is the resistance of the cell?

(Advanced, 1893.)

When the galvanometer terminals are joined by the wire of 0·1 ohm, the current flowing through the galvanometer will be equal to $\frac{0{\cdot}1}{0{\cdot}1 + \frac{1}{3}} \left(= \frac{0{\cdot}3}{1{\cdot}3}\right)$ of the current flowing through the main circuit. Hence, after shunting the galvanometer, the current flowing through the main circuit is equal to $\frac{1{\cdot}3}{0{\cdot}3} \times \frac{1}{2} = \frac{1{\cdot}3}{\cdot6} = \frac{13}{6}$ of the current flowing before shunting. Also the resistance R equivalent to the shunted galvanometer is given by

$$\frac{1}{R} = \frac{1}{\frac{1}{3}} + \frac{1}{0{\cdot}1} = 3 + 10 = 13. \quad \therefore R = \frac{1}{13}.$$

Let E = E.M.F. of cell, and r its internal resistance. Then, if C is the current before shunting the galvanometer,

$$\frac{E}{r + \frac{1}{3}} = C \quad \ldots\ldots\ldots \quad (1)$$

Since the current after shunting the galvanometer $= \frac{13}{6}$C, we have—

$$\frac{E}{r + \frac{1}{13}} = \frac{13}{6}C \quad \ldots\ldots\ldots \quad (2)$$

Dividing (2) by (1), we get—

$$\frac{r + \frac{1}{3}}{r + \frac{1}{13}} = \frac{13}{6}. \quad \therefore 6r + 2 = 13r + 1. \quad \therefore 7r = 1, \text{ and } r = \frac{1}{7} \text{ ohm.}$$

12. A Daniell cell, the internal resistance of which is 0·3 ohm, works through an external resistance of 1 ohm. What must be the resistance of another Daniell cell so that, when it is joined up in series with the first, and working through the same external resistance, the current shall be the same as before? If the cells be joined up in parallel, how will the current be modified?

(Advanced, 1893.)

Let E = E.M.F. of a Daniell cell. Then current before including second Daniell $= \frac{E}{1 + 0{\cdot}3} = \frac{E}{1{\cdot}3}$ ampères.

Let r be the resistance of the cell afterwards included. Then

$$\frac{2E}{r + 1{\cdot}3} = \frac{E}{1{\cdot}3}. \quad \therefore 2{\cdot}6 = r + 1{\cdot}3, \text{ and } r = 1{\cdot}3 \text{ ohms.}$$

If the two cells are joined in parallel, the E.M.F. in circuit will be E, and the resistance R equivalent to the two cells in parallel will be given by

$$\frac{1}{R} = \frac{1}{1{\cdot}3} + \frac{1}{0{\cdot}3} = \frac{1{\cdot}6}{\cdot39}. \quad \therefore R = \frac{\cdot39}{1{\cdot}6} = \cdot244 \text{ ohm (nearly).}$$

Hence current, when cells are joined in parallel,

$$= \frac{E}{1 + 0{\cdot}244} = \frac{E}{1{\cdot}244}.$$

Hence the current will be *decreased*, by joining the cells in parallel, in the ratio 1·3 to 1·244.

13. The E.M.F. of a battery is 18 volts, and its internal resistance 3 ohms. The difference of potential between its poles, when they are connected by a wire A, is 15 volts, and falls to 12 volts when A is replaced by another wire B. Compare the amounts of heat developed in A and B in equal times.

(Advanced, 1890.)

If V = P.D. between ends of a wire,
C = current flowing through wire,
then rate of production of heat in the wire is proportional to the rate of doing work in the wire—that is, to VC.

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In case of wire A, V = 15 volts.

To find C, notice that fall of potential inside cell = 18 − 15 = 3 volts.

Since internal resistance of cell = 3 ohms, current = fall of potential inside cell ÷ internal resistance = $\frac{3}{3} = 1$ ampère.

Hence, in case of wire A, rate of production of heat is proportional to $15 \times 1 = 15$.

In case of wire B, V = 12.

Fall of potential inside cell = 18 − 12 = 6 volts.

$$\therefore \text{ current } C = \frac{6}{3} = 2 \text{ ampères.}$$

Hence, in case of wire B, rate of production of heat is proportional to $12 \times 2 = 24$.

$$\text{Hence } \frac{\text{heat produced per second in A}}{\text{heat produced per second in B}} = \frac{15}{24} = \frac{5}{8}.$$

14. A battery is formed of four Grove's cells in series, and its poles are joined by a wire. If one electrode of a Thomson's quadrant electrometer is connected to the middle point of the wire, and the other electrode to the platinum of each cell in turn, describe the indications of the electrometer. (Advanced, 1890.)

Let Fig. 3 represent the arrangement when the second electrode of the electrometer is joined to the platinum E of the second cell of the battery. If we imagine the electrometer to be removed, and replaced by a thick wire AE connecting the centre A of the wire BC to the platinum E, then it can be easily seen that there will be no current in the wire AE. For, if r = the resistance of each cell, E = the E.M.F. of each cell, and 2R = the resistance of the wire BC, then the two cells, D and E, alone tend to produce a current in the wire AE, *from* E *to* A, equal to $\frac{2E}{2r + R}$. Also the two cells, F, G, alone tend to produce an equal current, *but from* A *to* E, in the wire AE. Hence there will be no tendency for the whole battery to produce a current in the wire AE, and the ends of this wire must be at equal potentials, so that, replacing the wire by the electrometer, there will be no deflection when the second terminal is connected to E.

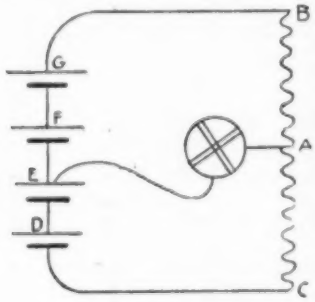


FIG. 3.

Reasoning in the same manner, it can be seen that a current would flow *from* A *to* D along a wire connecting A and D. Hence D will be at a lower potential than A, as would be indicated when the second terminal of the electrometer was connected to D. On the other hand, a current would flow *from* F *to* A along a wire connecting A and F, and a still greater current would flow from G to A along a wire connecting A and G. Hence F is at a higher potential than A, and G is at a higher potential than F.

Hence, finally, on connecting the second terminal of the electrometer successively to D, E, F, G, the platinum of the four Grove's cells, a deflection in one direction will be produced when the second terminal is connected with D, zero deflection when it is connected with E, a deflection in a direction opposite to that first obtained when it is connected with F, and a greater deflection, in the same direction as the last, when it is connected with G.

THEORETICAL MECHANICS.

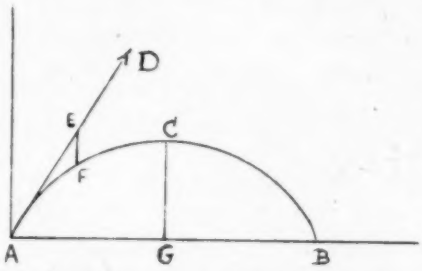
ADVANCED AND HONOURS STAGES.

BY F. CASTLE, M.I.M.E.,

Royal College of Science; Lecturer on Mechanics, Geometry, etc., Morley College, London; Author of "Elementary Practical Physics," etc.

MOTION OF A PROJECTILE.—When a particle is projected from a point A in a direction AD, making an angle of θ with the horizon, and with an initial velocity V, then neglecting resistance due to air, etc., we can find either its position or velocity at any subsequent time by simple applications of the laws of motion.

The path of the projectile is easily traced. If due to the velocity V, the point E would be the position, say, at the end of one second; then, due to gravity, the particle has moved in the same time a vertical distance EF = $\frac{1}{2}gt^2$, and this amount, when t is 1,



is simply $\frac{1}{2}g$. Hence, making AE = V, and EF = $\frac{1}{2}g$, a point F on the actual path is obtained. In a similar manner other points may be obtained, and the curve ACB (which is known to be a parabola) is described.

The resolved part of the velocity along a horizontal line is V cos θ, and along a line perpendicular to it is V sin θ.

The acceleration due to gravity is $-g$ in a vertical direction; thus the former is unaltered, but the latter is altered, by gravity.

Denoting the velocity at a time t by v, and the corresponding space by s, the time taken by the particle to reach the highest point C may be obtained from $v = V \sin\theta - gt$. At the point C the particle is for the instant considered at rest. Therefore $v = 0$, and we have

$$0 = V \sin\theta - gt. \quad \therefore t = \frac{V \sin\theta}{g}. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

The time of flight is obviously twice that given by (1), or is

$$\frac{2V \sin\theta}{g}.$$

If h denotes the greatest height GC to which the particle rises, then $h = Vt \sin\theta - \frac{1}{2}gt^2$. . . . . (2)

Substitute the value of t from (1), and we obtain

$$h = \frac{V^2 \sin^2\theta}{g} - \frac{g V^2 \sin^2\theta}{2g^2} = \frac{V^2 \sin^2\theta}{2g}.$$

The space described, called the *range*, is the product of the horizontal component and the time.

$$\therefore \text{ range} = V \cos\theta \times \frac{2V \sin\theta}{g} = \frac{V^2 \sin 2\theta}{g}.$$

From this result, as the maximum value of $\sin 2\theta$ is unity, it follows that the range is a maximum when the elevation is 45°.

Ex. 1. Find the position of a body at the end of a given time from the instant at which it is thrown with a given velocity in a given direction, the motion being supposed to take place *in vacuo*.

A body is thrown in a direction making an angle of 30° with the horizon, and passes through a point whose horizontal distance from the point of projection is $400\sqrt{3}$ feet, and vertical height above the point of projection is 76 feet; find the velocity of projection. ($g = 32$.) (1886.)

Here, if V denote the velocity of projection, and t the time taken by the body to reach the point whose co-ordinates are $400\sqrt{3}$ and 76, we have—

$$\frac{V \cos 30° \times t}{2} = 400\sqrt{3}. \quad \therefore V \times \frac{\sqrt{3}}{2} \times t = 400\sqrt{3},$$

$$\text{or } t = \frac{800}{V}. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

Also, from (2), $h = Vt \sin\theta - \frac{1}{2}gt^2$, where h is 76.

Substituting the value of t from (3),

$$\therefore 76 = \frac{V}{2} \times \frac{800}{V} - \frac{1}{2} \times 32 \times \frac{(800)^2}{V^2}.$$

$$\therefore V^2 = \frac{16 \times (800)^2}{324} = \frac{4^2 \times 800^2}{18^2},$$

$$\text{or } V = \frac{1600}{9} = 177{\cdot}8 \text{ ft. per sec.}$$

Ex. 2. Determine the range and time of flight of a particle projected *in vacuo* from a point in a horizontal plane.

If A be the point of projection, B the extremity of the range, P any position of the particle during flight, and C the point where AP produced cuts a vertical through B, show that the point C moves downwards during flight with a velocity equal to the initial vertical velocity of the particle. (1898.)

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OUR COMPETITION PAGE

OUR FRENCH PRIZE COMPETITION.

Prize Editor—W. T. THOMPSON, B.A. (LOND.), *French and German Honours.*

Important to Scholarship, Certificate, and London Matriculation Students.

WE should like to specially direct the attention of our readers to the fact that the Board of Education, in the Syllabuses for the Scholarship and Certificate Examinations 1901 and 1902, requires "no set books" for French and German. Students preparing for these examinations, as well as students for London Matriculation, could not do better than attempt month by month the pieces set for translation here. They are from the best authors, and of varied character. A competitor who does not gain a prize can derive considerable benefit from the exercise. A study of the successful competitor's translation, and of our remarks, will help him to see where he might have done better. If desired, his paper can be returned (fully corrected) by enclosing six stamps together with a stamped and addressed envelope.—ED.

RULES (as usual).

FRENCH PRIZE COMPETITION.

A Prize of One Guinea will be given for the best translation into English of the following extract:—

Jamais Henri Heine n'a songé à hâter sa fin, à se séparer volontairement de sa femme. N'avait-elle pas besoin de lui? N'était-il pas son protecteur? Ce rôle le flattait particulièrement; tandis que Mme. Heine s'occupait de ses fleurs ou de son perroquet, c'était lui qui, dans son état de *moribondage*, ordonnait, réglait et soldait toutes les dépenses. Après avoir, étant garçon, fait quelques dettes qu'avait payées son oncle Heine, le riche banquier de Hambourg, il était devenu, depuis son mariage, très scrupuleux pour balancer recettes et dépenses. Nous avons parlé déjà du sentiment protecteur dont il entourait sa femme. Mais il faut dire aussi qu'il était fier de subir l'influence magnétique de sa Juliette, influence si grande, assurait-il, que le son de *cette* voix, le contact de *cette* main, plusieurs fois, l'avait rattaché à la vie. Il faut citer à l'appui de ce pouvoir fluidique l'anecdote du perroquet, qui se place précisément dans les derniers temps de l'existence de Heine. Pris au milieu de la nuit d'une de ces crises meurtrières, que cette fois on pouvait à bon droit croire la dernière, sa femme accourut près de lui pleine d'effroi; elle saisit sa main, la pressant, la réchauffant, la caressant. Elle pleurait à chaudes larmes, et d'une voix entrecoupée, au travers des sanglots, il l'entendit répéter: "Non, Henri, non, tu ne feras pas cela, tu ne mourras pas! tu auras pitie! j'ai déjà perdu mon perroquet ce matin; si tu mourais, je serais trop malheureuse!" "C'était un ordre," ajoutait-il, "j'ai obéi, j'ai continué de vivre; vous comprenez, mon amie, quand on me donne de bonnes raisons....." Le malade s'amusa prodigieusement à me conter cette histoire; il la répétait complaisamment, en imitant l'intonation émue de Mme. Heine, et en soulignant le mot *perroquet;* il était à la fois dans la nature humoristique du poète d'être vivement touché de la douleur qu'il provoquait, et très amusé de la forme comique que le désespoir empruntait. MADAME JAUBERT.

RESULT OF THE MAY COMPETITION.

French.

The prize is awarded to "Petit Oiseau," the pseudonym of Miss E. Chambers, 19 Woodville Terrace, Bradford, Yorks.

First Class.—La printanière, A plain woman, Dreyfus, Nouveau venu, Agaznog, C.E.M., Le Guart, Esmond, Myosotis, A.K., Lesley, Juvenile, Stretton, Romeo, Quædam, Aiphos, Beetle, Ad solem, Viewforth, St. Regulus, Hungary, Kettering, Elaine (Inverurie), Floradora (Devonport), S.T.S., Rubis sur l'ongle, Leilani, La plume, Chemineau, Rioghail, Erimus, Ein kleines Veilchen, Ouard, Llanroc, Wessex, Antron, Japanese Fan, Vincit, Shakspere, Jamie Soutar, White Heather, Bella, Tant pis, Portlairge, Map, Poulton, Bull-dog, Ex parte, Chihuahua, Leo, Caedmon, Penyghent, Alicia, Zetland, Disappointed one, Irénée, Carpe diem, Cat's-eye, Undine, Veronica, Petite, Mab, L.S., Lorna, Ruddigore, Floradora (Bradford), Kerboga, Nightingale, Priory, J.E.C., Mentalia, Egremont, Alluden, Elf, Virginia Creeper, Bobs, Paddy, Mac, Esperantisto, Thor, La petite, Hold fast, A.S.P.H., Elaine (Blackhill), Gerardus, Réséda, Fleur-de-lys, Fertilis, F.W.S.G., Rus, Antoine, Pansy, Il penseroso, Violet, Marcus, Kelvingrove, La poupée, Agricola, Mignon, Grégoire, Try again, Ystrad, Conatus sum, Tirez fort, Micawber, Audidaw, Pratique, Une débutante, Freesia, Nancy, Sardius, Débutante, Anchor, Sinclair, Greenock, Hélène, Tyke, Blotting-paper, Olive, Nil desperandum, Josephine, Humility, E.S., Discipulus, Le champ de la chapelle, Bees, Bowring, Dinner-time.

Second Class.—Jeunesse, Didymus, J.S.M., Mercia, Dolores, Kler, Yebba, Chez nous, Betti, Marguerite, Walnhoj, Winter, Phædra, Gitano, Jessamine, Tottenham Hotspur, Skoola, Allets, Endeavourer, T.T., Leuchars, Macaulay, Shaftesbury, Killarney, Silly Suffolk, Beaulieu, Non est, Denise, Over Norton, Penybont-ar-Ogwy, Une anglaise, Diana, M.R.M., Pyz, Vwretter Post, Evadne.

Third Class.—K.M., Ormuz, Pause.

Disqualified.—Rule 2: Dumas, Sigma, Gabriel, Thame.

Report.

There is little to note specially. The argument of the extract was easy to follow, and the mistakes which occurred were in particular phrases. Very few gave an accurate translation of *comme elle en est bien la maîtresse. Elle*, of course, refers to *opinion*, and the meaning very clearly is that public opinion, which does not view our actions from the standpoint of strict morality, may at its will assign to a particular action either praise or blame. A feature of this month's competition which has impressed me is the number of those who have translated incorrectly through confounding French words very similar in spelling. About a dozen connected *médite* with *médire*, and produced such renderings as, "I never slander this terrible subject." Others confused *vaut* with *veut*, and one competitor, bolder still, translated *ce que nous devons au tempérament* as, "lest they devour temper."

French Prize Translation.

It is not crime, but dishonour that we fear; and so long as public opinion acquits us of blame, or perhaps even, since it has the power to do so, bestows honour instead, we transgress boldly, and the man so inclined calls himself without scruple an upright or at least an honest man; and who knows if he does not even thank God that he is not as other men are? It is a delirium that a moment's reflection should make us blush for. Undoubtedly the Romans showed profound wisdom in using the same word to express fortitude and virtue. There is, in fact, no virtue, properly speaking, without self-conquest, and whatever costs nothing is worth nothing. Our virtues forsooth! Strip them of all that we owe to temperament, honour, pride, restrictions, environment, and what remains? Alas! but very little. I am not ashamed to confess to you that never do I meditate on this tremendous subject without being impelled to throw myself to the ground like a culprit suing for pardon, without accepting in advance all the misfortunes that could befall me, as a slight acknowledgment of the vast debt which I owe to the Eternal Rectitude. And yet you would scarcely believe how many people have said to me, during my life, that I was a very honest man. PETIT OISEAU.

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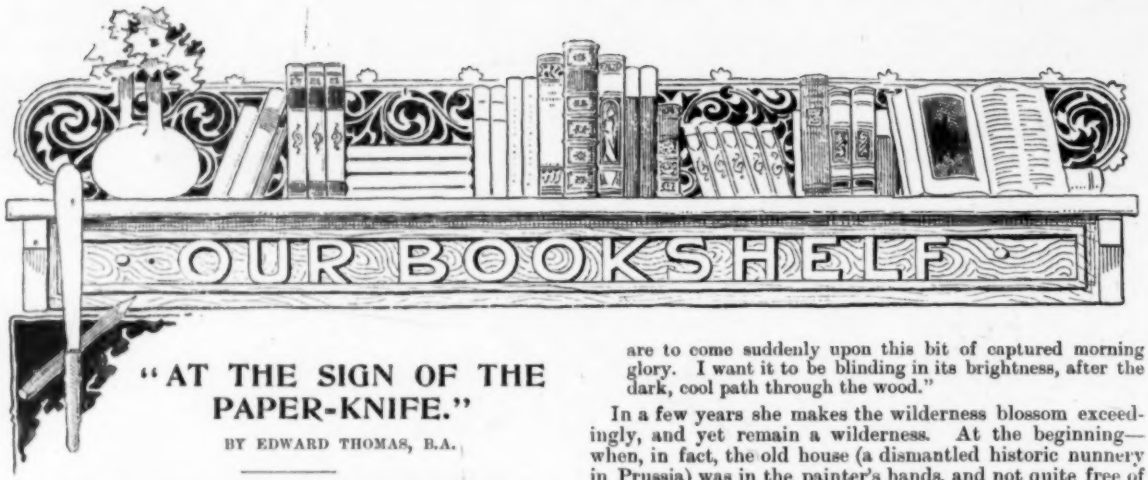

"AT THE SIGN OF THE PAPER-KNIFE."

BY EDWARD THOMAS, B.A.

"ELIZABETH AND HER GERMAN GARDEN," AND "THE SOLITARY SUMMER."*

THE author of these pleasant volumes is amazed at the rarity of those who love gardens. Probably most of us will think that she is mistaken; but that those who love them, and can write about them also, are rare, there is little doubt. Our author is among the few. She is with Sir William Temple and Sir Thomas Browne. The grave orderliness of these famous lovers of gardens, indeed, does not square with her desire; and that *fantaisie déréglée* which her husband blames in her passion for outdoor meals gives a twist to her gardening schemes. She will have nothing to do with mathematical conventionality in rows and beds. Apple-blossom shall glow in the shadow of the pines; the dandelions shall be as welcome boarders on the lawn. She almost likes the weeds (except nettles), because they flourish without any of the attention which was so wasted on the "Doctor Grill" rose.

> "Doctor Grill," thinks Elizabeth, "must be a German rose. In this part of the world, the more you are pleased to see a person, the less is he pleased with you; whereas, if you are disagreeable, he will grow pleasant visibly.....But I was not prepared for that sort of thing in a rose, and was disgusted with Doctor Grill."

Her very fancies are fantastic; I do not think she would have approved Andrew Marvell's sun-dial wrought in flowers—

> "Temporis O sauves lapsus! O otia sana!
> O herbis dignæ numerari, et floribus, horæ!"

She agrees rather with Bacon, who says, superciliously, "You may see as good sights many times in tarts." Consequently she fell out with all her gardeners, save a deaf one, to whom it was useless to read aloud her instructions, and who greeted all her heartiest whims with a barely surprised remark that they were "very modern indeed."

Late in December she is deep in the joy of making her spring lists. With that blithe taste of hers, she is anxious to have a border

> "All yellow, every shade of yellow, from fiercest orange to nearly white; and the amount of work and studying of gardening books it costs me will only be appreciated by beginners like myself. I have been weeks planning it, and it is not nearly finished. I want it to be a succession of glories from May till the frosts; and the chief feature is to be the number of 'ardent marigolds'—flowers that I very tenderly love—and nasturtiums. The nasturtiums are to be of every sort and shade, and are to climb and creep and grow in bushes, and show their lovely flowers and leaves to the best advantage. Then there are to be eschscholtzias, dahlias, sunflowers, zinnias, scabiosa, portacula, yellow violas, yellow stocks, yellow sweet-peas, yellow lupins—everything that is yellow or that has a yellow variety. The place I have chosen for it is a long, wide border in the sun, at the foot of a grassy slope crowned with lilacs and pines, and facing south-east. You go through a little pine wood, and, turning a corner, are to come suddenly upon this bit of captured morning glory. I want it to be blinding in its brightness, after the dark, cool path through the wood."

In a few years she makes the wilderness blossom exceedingly, and yet remain a wilderness. At the beginning—when, in fact, the old house (a dismantled historic nunnery in Prussia) was in the painter's hands, and not quite free of ghosts—she was acutely happy, and asks,—

> "What are you to do if your conscience is clear and your liver in order and the sun is shining?"

She is always equally happy and equally persuasive.

"We may talk what we please," wrote Cowley, "of lilies and lions rampant, and spread-eagles in fields d'or and d'argent; but if heraldry were guided by reason, a plough in a field arable would be the most noble and ancient arms." It is a fine thought. But to Elizabeth a spade, a compliant soil, and a pouch of seeds are sweeter symbols. They are more: they are sublime. And her garden is even as the heaths which expand around it, across which

> "One can see into eternity almost; and to go out on to them with one's face towards the setting sun is like going into the very presence of God."

And in this place she usually wished to be what she elliptically calls "alone," though she seems never to be alone. Her husband (indifferently called "Sage" or "Man of Wrath"), her three babies ("April," "May," and "June"), the deaf gardener, and perhaps her friend Irais, are the only company she really seeks. The rest she wishes away.

> "Wise people," she comments, "want so many things before they can even begin to enjoy themselves, and I feel perpetually apologetic with them."

Her apologies have a kind of sweet disdain which is most engaging. Partly, too, her solitude is dear, because she indulges at times a perfectly healthy, debonair melancholy; for—

> "It is so sweet," she writes in July, "to be sad when one has nothing to be sad about."

If she reads out of doors, she chooses the kindred souls of Thoreau, Keats, Wordsworth, Spenser. Once, it is true, she took out into the garden a Life of Luther.

> "He was," she reflects, "a wonderful man, but I am glad I was not his wife."

She is, perhaps, a little brave in her cultivation of solitude. Her conversations with the flowers and trees—silent, and yet delicately recorded—are not quite food enough for her; so that she writes, in mid-May:—

> "On some very specially divine days, like to-day, I have actually longed for some one else to be here to enjoy the beauty with me. There has been rain in the night, and the whole garden seems to be singing—not the untiring birds only, but the vigorous plants, the happy grass and trees, the lilac bushes. Oh, those lilac bushes! They are all out to-day, and the garden is drenched with the scent. I have brought in armfuls, the picking is such a delight; and every pot and bowl and tub in the house is filled with purple glory; and the servants think there is going to be a party, and are extra nimble; and I go from room to room gazing at the sweetness; and the windows are all flung open, so as to join the scent within to the scent without; and the servants gradually discover that there is no party, and wonder why the house should be filled with flowers for one woman by herself; and I long more and more for a kindred spirit—it seems so greedy to have so much loveliness to

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oneself. But kindred spirits are so very, very rare; I might almost as well cry for the moon. It is true that my garden is full of friends, only they are—dumb."

We are introduced to many of her acquaintances, and sometimes feel that the pastoral note is a little spoiled by some rather ineffective echoes of the world outside. The satire conveyed through Elizabeth's description of Minora and the governess, Miss Jones, sparkling as it often is, and even the sober human colouring in that not very solitary *Solitary Summer*, come as a real shock, in volumes which are otherwise the very gospel of lovely peace. There are transitions—sudden bounds—from the naïve to the over-sophisticated which might rouse ungentle criticism. For instance, she is led into some obvious, stale, and unprofitable mirth at the expense of the English first of May. We much prefer such texts as, "I should love to weed." But we need not grudge her an occasional parenthesis to prove that she, at least, does not deserve the scorn which the "Man of Wrath" pours on the feminine mind. It is a natural vanity, and we hope the tea-roses and tulips approve—which, after all, is the real test, and Elizabeth knows them best. Her cleverness might, however, have suggested that "dreams of pink and purple peace" is an undesirable sound; though, as a rule, her style is in harmony with her own dictum: "Simplicity.....is, of all the virtues, the one I prize most." For this and her other virtues we cannot be too grateful. She has lent us the most delightful garden in the world, next to our own. She has made

> "A bower quiet for us, and a sleep
> Full of sweet dreams and health and quiet breathing;"

and we share with her the ecstasy, though (so wonderful are her words) not the disappointment, which she describes in *The Solitary Summer*.

> "Not far from here," she writes in August, "there is a low series of hills running north and south, absolutely without trees; and at the foot of them, on the east side, is a sort of road, chiefly stones, but yet with patience to be driven over; and on the other side of this road a plain stretches away towards the east and south; and hills and plain are now one sheet of gold. I have driven there at all hours of the day—I cannot keep away—and I have seen them early in the morning, and at midday, and in the afternoon, and I have seen them in the evening by moonlight, when all the intensity was washed out of the colour and into the scent; but just as the sun drops behind the little hills is the supreme moment, when the splendour is so dazzling that you feel as though you must have reached the very gates of heaven. So strong was this feeling the other day, that I actually got out of the carriage, being impulsive, and began almost involuntarily to climb the hill, half expecting to see the glories of the New Jerusalem all spread out before me when I should reach the top; and it came with quite a shock of disappointment to find there was nothing there but the prose of potato fields, and a sandy road with home-going calves kicking up its dust, and in the distance our neighbour's *Schloss*, and the New Jerusalem just as far off as ever."

Another Jubilee Celebration.—The enterprise of the Singer Manufacturing Company is this year manifesting itself in a manner which is more than usually advantageous to the general public. It is fifty years since the first Singer sewing-machine was invented and put on the market, with a capital of one hundred dollars, and the success of this company since its incorporation has been most remarkable. Singer's are all over the world, and the sales amount to over one million sewing-machines a year. Their jubilee celebration is therefore going to be on an unusually large scale. They recognise the fact that the sale of over seventeen million machines—their total sales up to date—represents an enormous patronage; and in order to give such recognition a practical form, they have decided to present to the public, free, an unlimited number of their magnificent sewing-machines, on conditions which seem to us the essence of simplicity and reasonableness. (For want of space we are unable to give details of Messrs. Singer's plan.) Any one can, however, participate; and as this offer is intended for this year only, we recommend all who would like to be possessed of one of these greatest labour-saving machines of the century to apply at once to any of the company's five hundred branches in this country, or to any of their five thousand representatives, for full particulars. The plan does not extend beyond Great Britain and Ireland.

SCIENCE NOTES.

African Ornithophilous Flowers.—The arrangements exhibited by flowers in Eastern Tropical Africa for pollination by birds are very interesting. They are mostly scarlet or purple, or some shade of brown, corresponding to the colours of the male as contrasted with the female honey-birds, the representatives in Africa of the American humming-birds, which are the chief agent in their pollination. There are eight types of flowers: (i.) the *Myrtaceæ* type, in which the attractive part of the flower is usually the long white stamens; (ii.) the *Bruguiera* type, with pendent bell-shaped flowers, the access to the honey being between the style and the stamens; (iii.) the *Ceiba* type, corresponding to Delpino's fuchsia type; (iv.) the *Hibiscus* type, with tubular or bell-shaped horizontal or pendent flowers, the organs of reproduction being either projecting or completely enclosed; (v.) the *Aloe* type, flowers with a long narrow tube equalling in length the beak of most *Nectarineæ*; (vi.) lip flowers with labiate zygomorphic flowers; (vii.) the *Erythrina* type, horizontal zygomorphic flowers with strongly projecting reproductive organs; (viii.) flowers with explosive pollen sacs.

Humus as a Source of Nitrogen.—Reinitzer finds that, when sugar is present, *Penicillium* has the power of obtaining its nitrogenous constituents from humus, which must therefore be regarded as a source of nitrogen for soil organisms.

Quinone.—It has lately been discovered that the active principle of the venom excreted by the cutaneous glands of the common myriapod, *Julus terrestris*, is quinone. This is the discovery of Behal and Phisalix. Beijerinck has discovered that quinone secreted by a saprophylic fungus, *Streptothrix chromogenes*, found on the roots of certain trees, plays an important part in the formation of humus. What is its physiological significance in the myriapod, which also lives upon decaying vegetable matter, is uncertain. We may conclude that its powerful odour serves the animal as a protection from its enemies.

The Parasitism of the Ustilagineæ.—It is generally held that the parasitism of the *Ustilagineæ* is obligatory. Brefeld has instituted some experiments, however, that go far to disprove this theory. He has succeeded in growing several species of *Ustilago* quite independently of any host plant, and finds that they thrive especially on the fæces of domestic animals, a point of great importance in the spread of smut and other diseases to which they give rise in cereal crops. In the case of most cereals there is only one period in which they are liable to the attacks of these parasites—namely, in the earliest stages of germination, when the tissues are very soft; after that they are exempt. When once it has entered the plant, the parasite will, however, find its way to the growing point and destroy the inflorescence. The smut of Indian corn, *Ustilago maydis*, exhibits rather different properties from those of other species, since it attacks not only young but also mature plants. Brefeld's experiments lead him to the conclusion that the spread of smut is due to the power not only of the winds, but also of the ustilago spores or smut spores to disseminate and multiply rapidly outside the host plant.

Food in the Stone Age.—Mr. Charters White, formerly President of the Royal Odontological Society of Great Britain, has lately conducted some curious experiments. He examined some skulls dating back from the Stone Age, and noticed that several of the teeth, although quite free from *caries*, were coated with tartar. On dissolving the tartar in weak acid a residue was left, which under the microscope was found to consist of corn-husk particles, hairs from the inside of the husks, spiral vessels from vegetables, particles of starch, the point of a fish tooth, a conglomeration of oval cells, probably of fruit, the bristlets of down, and portions of wool. There were also many sandy particles, some relating to quartz and some to flint, which were very likely attributable to the rough stones used in grinding the corn, and would account for the erosion of the masticating surfaces, which in many cases was strongly marked.

Coalfields in Rhodesia.—Experts sent out by the British South Africa Company report the existence of vast fields of coal some two hundred miles north-west of Buluwayo. Spread over an area of about four hundred square miles, the mineral presents itself in seams varying from five to sixteen feet thick, and as the coal lies within forty feet of the surface, it can be worked by inclines instead of by shafts. It is estimated that one thousand five hundred million tons of coal of better quality than that in use in the Transvaal, Natal, and Cape Colony—in some cases being comparable with Welsh coal—will be available for mining. This favourable report is said to have influenced the survey for the projected Cape to Cairo Railway, which will now be taken through these coalfields.

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Works of fiction do not usually bulk largely in this column, but there are some which, by reason of their subject or by reason of their authors, are appropriately introduced to the notice of our readers in this place. **The Eternal Quest,** by John A. Steuart, comes under this category for the second of the reasons mentioned, if not for the first likewise. Some of our readers have no doubt pleasant memories of Peter Proudfoot, M.A., the noteworthy Scottish dominie of the old school, who played so prominent a part in *The Minister of State*, by the same author. Even after reading his other works, all of which are in style and in conception alike far above the ordinary level of the day, we still think that Peter Proudfoot is the strongest character Mr. Steuart has evolved; but we are no doubt biased more or less by our own particular "idols" and interests. Yet we admit most willingly that this new volume is worthy to occupy a place on the same shelf as that which enshrines the inimitable dominie. We like Mr. Steuart's old men better than his young ones—personal bias again, no doubt, increasing with years—and we find in the Rev. Colin Carmichael, retired army chaplain, a type of man whom we should like to know in the flesh, and, we may add, whose portrayer or creator we should also like to know. The relations existing between this noble old fighting preacher and his former general are ably conceived and "convincingly" depicted; and when it is said that these relations embrace combined, though unwilling, action by the two veterans to thwart a love match between the penniless son of the general and the similarly endowed daughter of the chaplain—all for their best interests, of course, and all in vain—enough has been revealed to indicate the complex problem which the novelist has chosen to solve. The strength of the book is in its military side. It would be hard to find more stirring writing than the chapter in which these two heroes of the Mutiny tell the young lieutenant what he must go to visit among the scenes of their former warfare, and incidentally depict some of the strong scenes of that ever-fresh drama. Our writer is almost too daring in the freedom with which he introduces scenes, and even recognisable portraits, which belong to the most modern parts of our history, in the Soudan, in West Africa, and in the Transvaal War; but his accomplishment is equal to the task he voluntarily sets himself to face, and the result is a thoroughly modern and entirely wholesome tale of the romance which never really grows old—the quest of youth for love and for glory. We recommend this book warmly to those in search of good reading for the holidays or for the sacred Friday evening at home.

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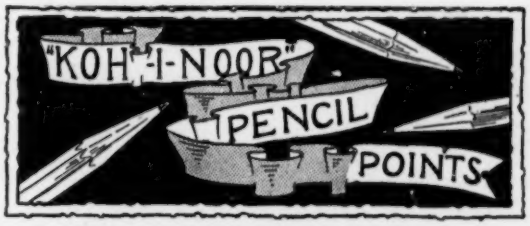

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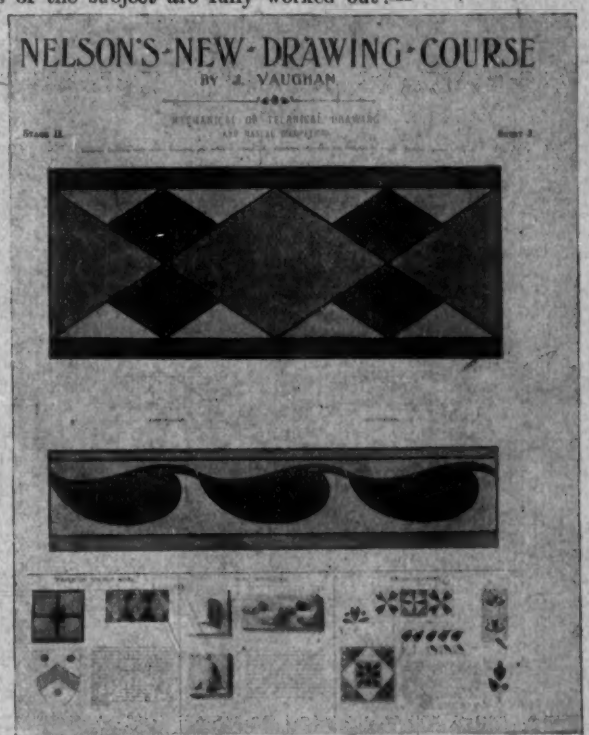

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